



Release 5.0

WAN User's Manual

Part Number 800-1848-50 Rev. A

April 1996

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Safety Warnings and Cautions

Various safety agencies request statements of warning or caution to help you in the safe operation of the MICOM unit. These statements also apply to any and all modules installed within the unit.

To ensure adequate cooling of the equipment a 2.0 inch unobstructed space must be maintained around all sides of the unit.

The ac power socket shall be installed near the equipment and shall be easily accessible.

Installation and access to the interior of this unit shall be made only by a qualified technician.

Connection to the network is to be disconnected before the (mains) plug is removed.

Warning

Remove power plug from the power socket before performing any service work on the unit.

Lithium Battery Caution

Danger of explosion if battery is incorrectly replaced. Replace only with the same type or equivalent battery, as recommended by the manufacturer. Discard used batteries according to manufacturer's instructions.

The power supply is auto-ranging in this model.

The power supply cordset to be supplied in Europe must have 0.75²mm, 3 conductor "HAR" cord type H05VV-F, terminated in a grounding type Shucko plug on one end and a molded - on IEC 320 connector on the other end.

Technical Data

Input Volts	: 100-240 Vac -5%, +10%
Input Current	
Marathon	
5K Turbo, 10K,	
20K	
NetRunner	
500ET, 1000E,	
2000E	: 3A-1.5A
Marathon 2K,	
2K Plus, 3K	
NetRunner 75E	: 2A-1A
STADIA	
Integration Hub:	6A-3A
Frequency	: 47-63 Hz

Um die Kühlung des Gerätes nicht zu beschränken, ist es notwendig um das Gerät herum an allen Seiten ca 5 cm Raum zu lassen.

Stellen Sie das Gerät in der Nähe einer geerdeten Schutzkontaktsteckdose so auf, dass diese leicht erreichbar und zugänglich ist.

Die Montage und der Zugang ins Innere des Gerätes sind nur einem qualifizierten Techniker gestattet.

Ehe der Netzstecker aus der Steckdose gezogen wird, müssen sämtliche äusserliche Verbindungen vom Gerät getrennt werden.

Warnung

Vor öffnen des Gerätes, muss der Netzstecker aus der Steckdose gezogen werden.

Lithium Batterie Warnung

Explosionsgefahr besteht wenn die Batterie nicht richtig ersetzt ist. Die Batterie darf nur mit einer gleichen oder gleichwertigen Batterie ersetzt werden.

Netzteil ist mit automatischer Umschaltung entsprechend der Versorgungsspannung versorgt.

Die Netzleitung sollte ein harmonisierter Typ (HAR) sein, mit der Bezeichnung H05VV-F oder H05VVH2-F, 3G 0.75²mm, mit einem Schutzkontakt - und einem Kaltgerätestecker (IEC 320).

Technische Daten

Nennspannung	: 100-240 V~ -5%, +10%
Nennstrom	
Marathon	
5K Turbo, 10K,	
20K	
NetRunner	
500ET, 1000E,	
2000E	: 3A-1.5A
Marathon 2K,	
2K Plus, 3K	
NetRunner 75E	: 2A-1A
STADIA	
Integration Hub:	6A-3A
Frequenz	: 47-63 Hz

Pour assurer un refroidissement adéquat, maintenir un espace libre de 5 cm (2 pouces) tout autour de l'appareil.

Installer la prise AC à proximité de l'appareil, dans un rayon d'accès facile.

L'installation et l'ouverture de cet appareil est permise par un technicien autorisé seulement.

Avant de débrancher la prise de courant, assurer que toutes les connexions externes ont été déconnecté de l'appareil.

Avertissement

Débrancher la prise de courant avant d'entreprendre aucun travail de réparation de l'appareil.

Batterie Au Lithium Avertissement

Un danger d'explosion existe si la batterie est remplacée incorrectement. Remplacer avec une batterie identique ou similaire, recommandée par le fabricant. Disposer des batteries utilisées selon la méthode prescrite par le fabricant.

Ce modèle s'adapte automatiquement au courant électrique ou voltage de la prise murale.

En Europe, brancher l'appareil à la prise murale au moyen d'un fil "HAR" comprenant 3 cables H05VV-F ou H05VVH2-F de 0.75²mm chacun, avec à une extrémité une prise de terre genre SHUCKO et à l'autre une prise IEC 320.

Donnees Techniques

Voltage d'Accès	: 100-240 V~ -5%, +10%
Courant d'Accès	
Marathon	
5K Turbo, 10K,	
20K	
NetRunner	
500ET, 1000E,	
2000E	: 3A-1.5A
Marathon 2K,	
2K Plus, 3K	
NetRunner 75E	: 2A-1A
STADIA	
Integration Hub:	6A-3A
Fréquence	: 47-63 Hz

Notification of FCC Requirements

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Changes or modifications to this product, that could increase the amount of Radio Frequency Emissions from this product, without the expressed written approval of MICOM Communications Corp., could cause the product and the user to violate the FCC's Rules and Regulations, thus requiring the product to be turned off or disconnected.

If this unit is used on a DTE which requires use of shielded cables for compliance with FCC Part 15, then use of a filtered pin connector may be required to maintain FCC compliance. See the Installation section for specific applications.

Notification of Canadian Requirements

This digital apparatus does not exceed the Class A limits for radio noise emissions from digital apparatus as set out in the Radio Interference Regulations of the Canadian Department of Communications.

Le présent appareil numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de classe A prescrites dans le règlement sur le brouillage radioélectrique édicté par le Ministère des Communications du Canada.

United Kingdom Requirement: Interconnection of Ports Warning

Interconnection directly, or by way of other apparatus, of ports marked "SAFETY WARNING. See instructions for use", with ports marked or not so marked may produce hazardous conditions on the network. The advice of a competent engineer must be obtained before such a connection is made. None of the ports provide isolation sufficient to satisfy the relevant parts of BS 6301. Apparatus connected to the ports, must either have been approved to the relevant parts of BS 6301 or to have been previously evaluated against BS 6301 British Telecom Technical Guides 2 or 26, and given permission to attach. Other usage will invalidate any approval given to this apparatus.

Any or all of the ports on the following modules may be configured as non-network ports:

- Communications Control Modules (CCM): 6 D-type ports
- Up to 4 Channel Expansion Modules (CEM): up to 6 D-type or 12 RJ45 ports
- LAN modules (including RTS, RLB, or IRM): AUI, BNC, and 8-pin modular jack ports
- NMS module: 1 log port, 1 command port
- Up to 4 2-port voice cards
- Alarm port

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Glossary

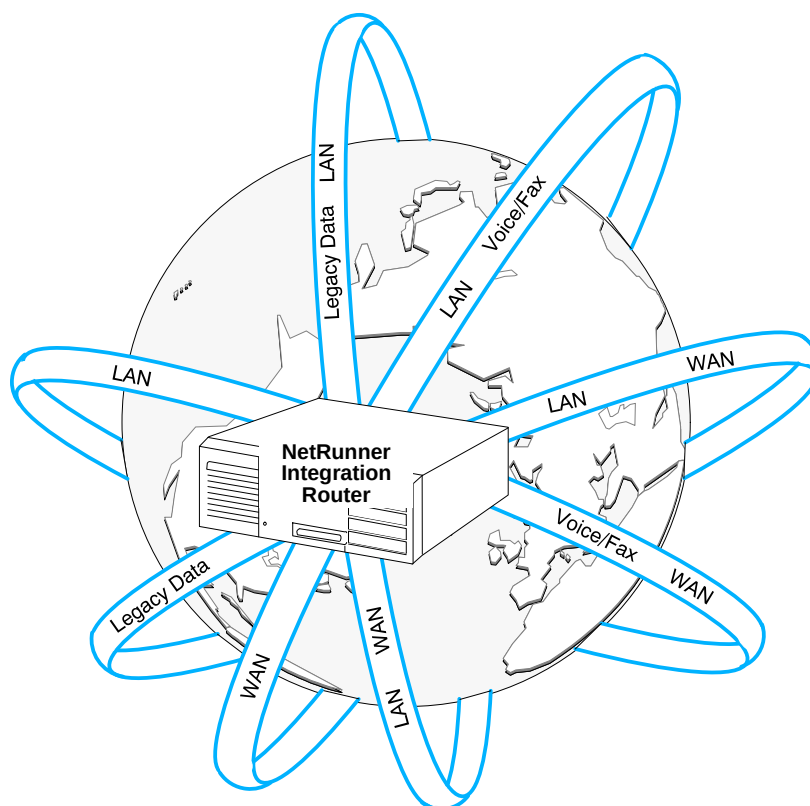
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Introduction 1

The NetRunner Integration Router is a part of MICOM's family of integration products designed to provide networking flexibility and cost-savings solutions for your internetworking needs. The NetRunner Integration Routers allow Local Area Networks (LANs) to connect over any distance using low-cost leased lines and/or frame relay links. This permits a device attached to a Local Area Network (LAN) at one site (for example, Los Angeles) to communicate with a device attached to a LAN at another site (for example, London).

The NetRunner features MICOM's EasyRouter technology. EasyRouter is actually a combination of several technologies that achieve the same traffic forwarding efficiency and LAN segment isolation as traditional routing, without the effort of network reconfiguration and maintenance.

An additional attraction of the NetRunner is its ability to integrate interoffice voice, fax and legacy data (sync and async) with Local Area Network (LAN) traffic, sending it all over the same leased line that handles the bridge and routing activities.



NetRunner Integration Router Model

Features

The NetRunner offers the following in its features package:

- EasyRouter technology consisting of the following features:
 - ARP spoofing for TCP/IP networks, a MICOM-developed software algorithm which limits broadcast traffic and storms.
 - SAP/RIP spoofing for Novell IPX networks, a MICOM-developed software algorithm which limits broadcast traffic and storms.
 - WAN optimization, for Novell IPX networks, reducing WAN bandwidth requirements when IPX routing or SAP/RIP spoofing is enabled.
 - Intelligent multi-site bridging, for all protocols, which learns the WAN paths leading to specific devices and forwards traffic only across the best paths. The bridge functionality has the following features:
 - Flexible filtering. Packets can be filtered by protocol, source address, or pattern match.
 - Self-learning. Automatically learns addresses and locations of network nodes and devices.
 - Spanning Tree. Supports the IEEE Spanning Tree Protocol, to prevent loops in bridged networks.
 - Hardware data compression which compresses LAN data before forwarding it across the WAN.
 - TCP/IP, LAT, and IPX header compression (in software compression mode only)
- Voice/fax integration – Voice/fax traffic can be compressed and combined with LAN traffic over a single Wide Area Network (WAN) link.
- Alternative WAN connection – A frame relay access link, supporting rates up to T1, provides alternative Wide Area Network (WAN) connections to leased lines.
- Maximum network capability and administrative control are provided by a suite of features:
 - Bandwidth On Demand: A technique providing additional network traffic capacity during peak traffic periods. An analogy would be opening extra lanes on a freeway or expressway during peak hours to ease traffic flow.
 - Bandwidth on Time of Day: A feature allowing nodes in a network to activate and deactivate their WAN links based on a pre-configured time schedule. Bandwidth on Time of Day can be used in either single link applications by initiating a link from one site to another at a set time schedule or in dual link applications providing additional link bandwidth between two sites during periods of anticipated higher bandwidth requirements.
 - Real Time Clock: Allowing one node to broadcast and set the time and date for the entire network.

- Code download capabilities allowing for local or remote updating of the Integration software on the following, when these modules have code download capability:
 - Flash memory located in Communications Control Module (CCM) FlashPaks, at release 4.0 and later.
 - The Communications Control Module portion of NetRunner 75E Branch Office Router LAN/WAN Modules, release 4.0 and later.
 - Integration Router Modules, release 6.0 and later. (Requires Communications Control Module Release 4.2, Rev. B or later.)
- Dual Local Area Network (LAN) ports – Two LAN ports are provided in the NetRunner 2000ED product for more Integration Routers per Network Node.
- Management – The Integration Router can be managed from:
 - Any workstation or terminal attached to an Integration unit.
 - a workstation on the LAN using telnet or LAT.
 - NETMan (MICOM's Network Management System).
 - SNMP-based network management systems. The Integration Router SNMP Network Management Agent supports monitoring queries (GETs) for most MIB II objects.
- Modem and DSU/CSU options – Modems or Integral DSU/CSUs may be installed for direct connection to the leased line.

Features and functionality for the Local Area Network (LAN) portion of the NetRunner Integration Router is described in the Integration Router User's Manual.

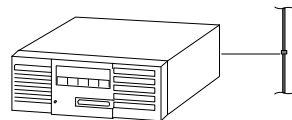
Model Numbers

There are several models available in the NetRunner family, as shown in the next diagram.

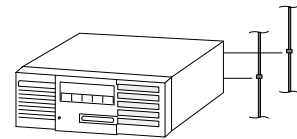
The larger capacity units (NetRunner 2000E, 2000ED and 1000E) are designed as central office routers for the main office site. A Network Node offers multiple WAN network links (up to 12) and multiple LAN router ports (NR2000ED). (Where information relates to both the NetRunner 2000E and the NetRunner 2000ED, the model numbers may be shown combined: NR2000E,ED.)

The smaller capacity unit (NetRunner 75E), is designed as a branch office router for remote site connectivity to a central office router. A Branch Office Router offers low cost, WAN network links and a single LAN router port.

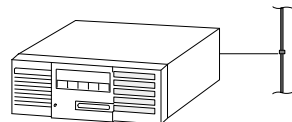
NetRunner Central Office Routers for the center of the hub at the central site:



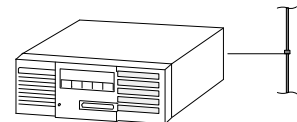
NetRunner 2000E Network Node
Model Number NR2000E/x



NetRunner 2000ED Network Node
Dual LAN Interface Modules
Model Number NR2000ED/x

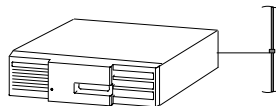


NetRunner 1000E Network Node
Model Number NR1000E/x



NetRunner 500ET Network Node
Model Number NR500ET/x

NetRunner Branch Office Router for remote site connectivity to the central office routers:



NetRunner 75E Branch Office Router
Model Number NR75E/x

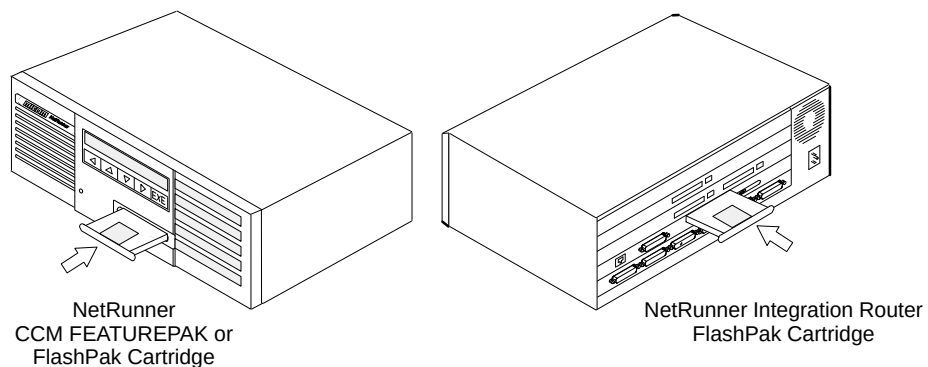
/x in the model number signifies D for domestic, I for international, or B for BABT (U.K.) versions.

Software

All NetRunner Models, except 75E

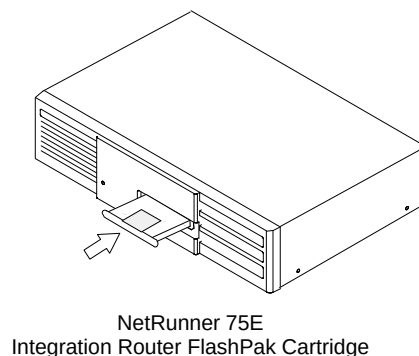
Overall NetRunner operation and configuration is controlled by the NetRunner FlashPak or FEATUREPAK cartridge, which resides in the Communications Control Module (CCM). This cartridge is installed in the front of the unit.

LAN operation and configuration is controlled by the NetRunner Integration Router FlashPak cartridge, which is installed in the Local Area Network (LAN) module at the rear of the unit.



NetRunner Model 75E

For the NetRunner 75E, overall NetRunner operation and configuration is controlled by a Flash bank installed on the LAN/WAN module. (The standard model contains single-bank Flash; a dual-bank Flash is an option.) The LAN operation and configuration is controlled by the Integration Router cartridge which is installed in the front of the unit.



Compatibility

Compatibility Across the Wide Area Network (WAN) link

Releases 2.5 and above of the NetRunner system (Communications Control Module) software are compatible with the current CCM software release.

The Integration Router is WAN compatible with release 3.0 or later of the NetRunner LAN module software. To operate properly, the LAN modules of all Integration units, which communicate across a single WAN to the Integration Router, must be running LAN Module software release 3.0 or later.

Compatibility On the LAN Segment

The Integration Router is compatible with all standard bridges, routers, bridge/routers, and other devices that reside on the same Ethernet segment as the Integration Router. The Integration Router is compatible with all previous releases of NetRunner across the Ethernet segment, as well.

Compatibility in Mixed Networks

In a LAN network containing mixed NetRunner system software releases, the LAN module with the oldest/least performance module will govern the overall performance and feature set of the Integration Router.

System Compatibility

For optimum Integration Router performance, MICOM recommends using release 3.2 revision C or later system (Communications Control Module) FEATUREPAK or FlashPak cartridge.

The network LAN code download feature of Integration Router release 6.0 requires that the NetRunner contain release 4.2 revision B or later system (Communications Control Module) software. NetRunner units containing earlier releases of cartridges do not support this feature.

Manual Companions

In addition to this manual, you received other manuals to facilitate the setup, startup, and use of your NetRunner products. In most cases, this is the order in which you use the manuals.

- The 3-Slot Chassis or 5-Slot Chassis Installation and Cabling manuals provide instructions on setting up the unit, turning it on, cabling the unit, and disassembling and reassembling the unit.
- This NetRunner WAN User's Manual is written to help you address the features and configurations of the Wide Area Network (WAN) functionality of the basic NetRunner unit. In this manual, the logical progression dictates that certain portions of menus are accessed at different times. Please note that, for each function explained, only the applicable menu portions are discussed; for an explanation of the full menu, please refer to the optional Command Facility Reference Guide.
- The Integration Router manual provides information about the Local Area Network (LAN) functionality, along with a complete description of the LAN commands.
- The Code Download User's Manual explains the procedures to download software.
- The LCD/Keypad manual details the use of the Liquid Crystal Display (LCD) and the keypad, which is a standard feature on the front of most NetRunner models.

Optional System Manual

The Command Facility Reference Guide, available in the optional System Manual (Model NR/UM/5), focuses in detail on all menus of the Command Facility (including optional modules). This guide will be especially handy when configuring the NetRunner unit for the first time, because it more completely discusses the menus, and each of the options and/or procedures to get to the next menu, or to complete the required function.

The Menu Flow Diagram, also part of the System Manual, shows the Command Facility and LCD/Keypad menus and hierarchy.

The optional System Manual also consists of manuals for a voice module and ISU module. All other optional modules are delivered with manuals which pertain to their individual installation and configuration requirements.

Terminology

- *WAN link* refers to the MICOM WAN network link. In the NetRunner Command Facility menus, the WAN link is called the interconnect link.
- *Integration Router* refers to the combination of a LAN module with an EasyRouter FEATUREPAK or FlashPak cartridge (release 5.0 or later) installed.
- *LAN module* is the circuit board with Ethernet connectors that is installed in a unit. It does not have the functionality of an Integration Router until the appropriate FEATUREPAK or FlashPak cartridge is installed. For NetRunner 75E, the components that make up the LAN module for other NetRunner units are part of the 75E's LAN/WAN module.
- *Bridge* refers to two or more LAN modules (or Integration Routers in bridge mode) and the WAN link(s) between them.
- A *node* is a NetRunner unit.
- A *unit* is any MICOM Integration unit.
- A *cluster* is a group of nodes assigned the same cluster name.
- A *device* is any kind of network equipment (personal computers, servers, printers, and so forth).
- A *module* is commonly referred to as a card or board.

Symbols

<cr>	Any terminal key (such as RETURN or Enter) that generates a carriage return.
<break>	Any terminal key that generates a BREAK signal.
^	Any terminal key (such as Ctrl) that sets the terminal to shift to the Control character mode.
<esc>	Any terminal key (such as Esc) that generates an escape character.
	Represents an option number selected using the terminal keyboard. It is shown in menu progressions beside the desired option name. The option number itself is shown except when it varies among models.
#	Symbol meaning number.

Basic Operation

Bridges and routers operate transparently to LAN users, including the NetRunner equipment operators at either side of the WAN network link. Following power-on and learning phases, data packets pass between LANs in either direction. Normally, the NetRunner operator may monitor the LAN traffic from time to time by observing the action of the indicator lights described in Section 7, but will otherwise not need to be involved in the operation.

With the exception of a malfunction, operator intervention will be required only to reconfigure the NetRunner or to obtain a display of existing parameters. These actions can be performed from a LAN device like a terminal or PC, or from the command console at any NetRunner unit.

The NetRunner units isolate network traffic, effectively controlling (filtering) the amount of traffic traveling between segments (across the WAN network link), which reduces overall network traffic. The Integration Router automatically discovers the other bridges and routers during the learning phase of the NetRunner start-up sequence.

When bridging or in EasyRouter mode, the Integration Router operates at the Data Link layer of the OSI reference model. This means that the Integration Router does not reproduce physical layer network problems like collision or network faults. While bridging, the Integration Router is not protocol sensitive. Data packets travel from the source to the destination node without the Integration Router needing to interpret the data.

When configured for traditional routing, the Integration Router operates at the Network layer of the OSI reference model. The Integration Router can route IP and IPX packets. All other packet types are bridged.

Options

Module	Description
Voice/Fax Module	These modules offer the ability to send voice or fax communications digitally across the link and are available to meet the requirements of most countries. The Digital Direct Series of modules provide a high-speed digital interface to a PBX and wide area network (WAN). It is designed for the NetRunner 500ET, 2000E and 2000ED. Up to 24 channels are supported.
CEM (Channel Expansion Module)	12-Channel CEMs: • A 12-channel async CEM with 8-pin connectors which are RS-232 (V.24) compatible. • A 12-channel async CEM with 8-pin connectors and integral line drivers which are RS-422/423 compatible. 6-Channel CEMs: • A 6-channel sync/async CEM with female DB-25 connectors which are RS-232 (V.24) compatible. • A 6-channel sync/async CEM with DMA. This module will support additional interconnect links. Connectors are female DB-25, RS-232 compatible. Only for NetRunner 1000E and 2000E,ED. • A 6-channel async CEM with female DB-25 connectors which are RS-232 (V.24) compatible.
ISU Module	The Integrated Service Unit (ISU) combines a Channel Service Unit (CSU) and a Data Service Unit (DSU) to connect to the Digital Data System (DDS) network. This provides a synchronous line at a speed of 56,000 bps. This module is available as a single or dual channel ISU. The dual channel ISU is available for models NR2000E, NR2000ED, NR1000E, and NR500ET.
NMS Module	The NMS module provides two ports: the dedicated command port for access to the Command Facility, and the log port for hard-copy output of reports. An external alarm device can be connected for audible or visual alarm notification. (For NetRunner 2000E, 2000ED, and 500ET, module must be Rev. D or later.) This module is not offered for the NetRunner 75E.

Additional Options	Description
NETMan	The MICOM Network Management System operates on a PC and is available in three packages: • Managing up to 10 nodes. • Managing up to 30 nodes. • Managing up to 254 networks of up to 254 nodes each.
Power Plus Redundant Power Supply Kit	A kit offering dual (redundant) power supplies for models except the NR75E.
STADIA Integration Hub	A hardware enclosure comprising three power supplies which can support up to four NetRunner CCMs plus optional modules and one NMS module.
Rack-Mount Kit	There are three rack-mount kits: • For all NetRunner models except model NR75E with standard power supply. • For all NetRunner models except model NR75E with Power Plus. • For NetRunner 75E (3-slot chassis).
Converter	The following converters are available: • The V.35 Converter can be attached to any port operating at a speed of 38.4 Kbps or greater and interfaces a link to a DTE/DCE. • The RS-530 converts RS-232 (V.24) ports to RS-530, which work in conjunction with RS-422 and CCITT V.11 circuits. RS-530 provides higher data rates and longer distances from the same DB-25 connector the RS-232 (V.24) uses. • The X.21 Converter adapts RS-232 (V.24) ports to X.21 (V.11).
SNAPS	The MICOM SNA Protocol Spoofer (SNAPS) is an intelligent device designed to provide SDLC support. It provides local polling for IBM SNA applications for either the host (FEP) or controller (PU), using the network to channel the SNA traffic.

Module Locations

5-Slot Chassis

There are five chassis positions available for modules in the NetRunner (except in the NetRunner 75E). These are identified from bottom to top as module locations A through E. The Communications Control Module (CCM) is always in module location A. The LAN module may be installed in any module location B-E. It is normally installed in module location B.

3-Slot Chassis

There are three chassis positions available for modules in the NetRunner 75E. These are identified from bottom to top as module locations A, B, C. The NetRunner 75E contains a LAN/WAN module in location A. This module contains both the Local Area Network software and the Wide Area Network software. The LAN portion of the LAN/WAN module is mapped logically to module location E.

Populating the NetRunner (Module Possibilities and Quantities)

The following lists the modules available for the NetRunner products, the module locations where each can be installed, and the maximum number of modules which can be supported without consideration to limits imposed by the hardware or software.

NetRunner 2000ED Network Node, dual LAN modules (Model NR2000ED)

Module	Module Locations					Maximum Modules Supported By Unit
	A	B	C	D	E	
CCM	X					1
Data Expansion Module 6-channel DMA ¹		X	X	X		1
LAN Module		X	X	X	X	2
Voice/Fax single-channel dual-channel		X X	X X	X X	X X	2 2
ISU single-channel dual-channel		X X	X X	X X	X X	1 1
Modem 14.4		X	X	X	X	2
¹ Supports six additional links when switch setting on module is set for B. With any other switch setting, the module supports 6 async or sync channels.						

NetRunner 2000E (Model NR2000E) and 1000E (Model NR1000E) Network Nodes

Module	Module Locations					Maximum Modules Supported By Unit
	A	B	C	D	E	
CCM	X					1
Data Expansion Module 6-channel DMA ¹		X	X	X		1
LAN Module		X	X	X	X	1
Voice/Fax single-channel dual-channel		X	X	X	X	3
		X	X	X	X	3
ISU single-channel dual-channel		X	X	X	X	1
		X	X	X	X	1
Modem 14.4		X	X	X	X	2
¹ Supports six additional links.						

NetRunner 500ET Network Node (Model NR500ET)

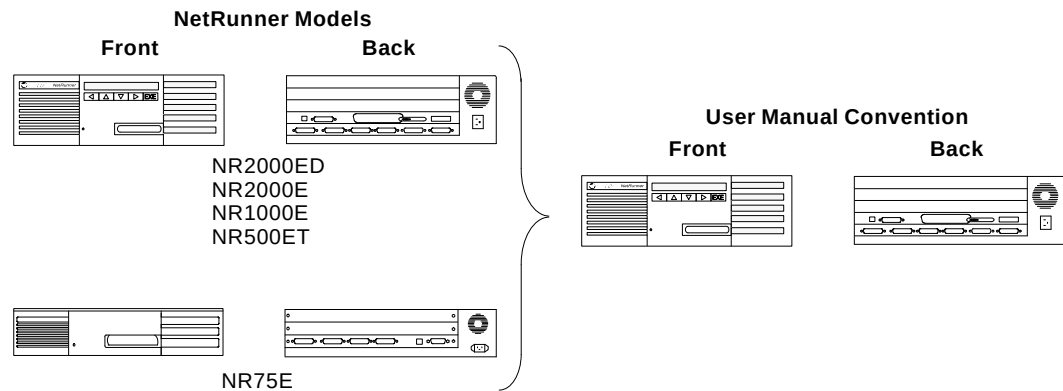
Module	Module Locations					Maximum Modules Supported By Unit
	A	B	C	D	E	
CCM	X					1
LAN Module		X	X	X	X	1
Voice/Fax single-channel dual-channel		X	X	X	X	3
		X	X	X	X	3
ISU signal-channel dual-channel		X	X	X	X	1
		X	X	X	X	1
Modem 14.4		X	X	X	X	2

NetRunner 75E Branch Office Router (Model NR75E)

Module	Module Locations			Maximum Modules Supported By Unit
	A	B	C	
LAN/WAN Module	X			1
Voice/Fax single-channel dual-channel		X	X	2
		X	X	2
ISU single-channel		X	X	1
Modem 14.4		X	X	1

Hardware Conventions

There are slight variations in the appearance of the NetRunner models. Due to these variations, the following convention will be used in this manual to represent all the NetRunner models. If information specific to a particular model is required, the detail for that model will be shown.



Network Planning 2

This section provides information in preparation for organizing and configuring your network. Planning involves the following topics:

- Planning the Topology
- Planning Prerequisites
- Clusters
- Plan the node numbers and node IDs (names) for the NetRunner nodes
- Channel prioritization across the Wide Area Network (WAN) link

Network Topologies

In the following pages, several topologies are discussed. Due to the flexibility of the unit, one or all of the following topologies are supported by your network:

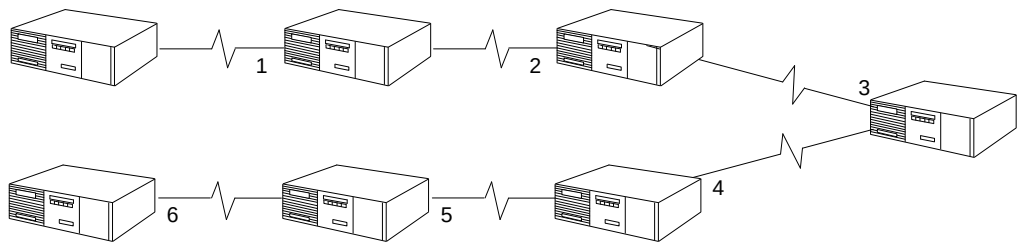
Topology	NetRunner Model			
	75E	500ET	1000E	2000E,ED
Point-to-Point	X	X	X	X
String	X ¹	X	X	X
Star, Distributed Star	X ¹	X	X	X
Mesh, Delta, Ring: looped networks (i.e., closed loops)	X ¹	X	X	X
¹ Frame relay applications only.				

MICOM recommends that you work with your MICOM Certified Distributor to ensure that the NetRunner unit meets the requirements of your network in the most effective and cost-efficient manner.

Terminated or Switched

Utilizing these topologies, a NetRunner 500ET, 1000E, and 2000E,ED can serve as either a terminated node (traffic is terminated in, or attached to the local node) or a switching hub (no locally attached devices). The NetRunner 75E is designed as a feeder to a switched hub. Without local traffic (data/voice/LAN), the NetRunner's WAN link capacity increases. The following elements need to be considered when putting together a network:

	NetRunner Model			
	75E	500ET	1000E	2000E,ED
● Link Capacity (non-frame relay)				
Terminated	64 Kbps	148 Kbps	128 Kbps	256 Kbps
Switched	n/a	148 Kbps	192 Kbps	384 Kbps
● Delay (varies between channel type and protocol)	Due to delays, do not exceed six link hops in any network path for units with voice/fax modules. Limit the link hops to three (four nodes total) if you are configuring <i>dynamic rate adaption</i> on your voice/fax module.			
Note:	Frame relay can be clocked to T1. A V.35 interface is required for these higher rates.			

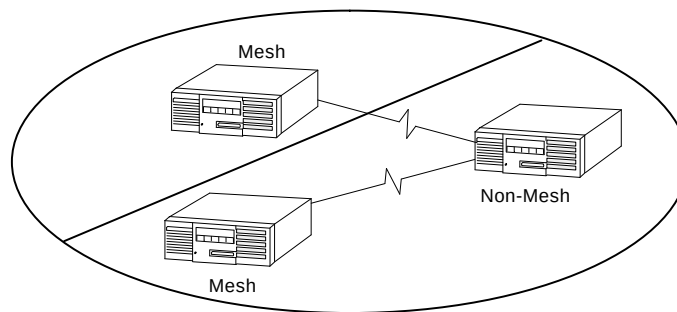
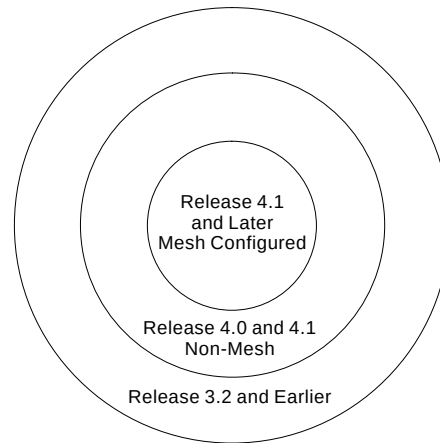


Example of a 6-Node Hop

Placement in the Network

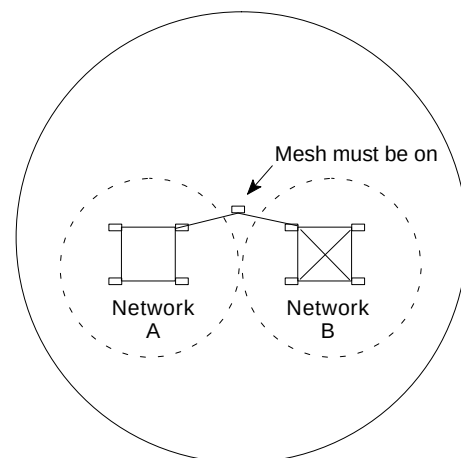
- Release 4.1 and later Mesh: configure for mesh in the hub of the network. Configure mesh for,
 - Units with closed loops
 - Connecting units between looped networks
- Release 4.0 and later Non-Mesh: attach to like kinds (same type).
- Generally keep *like types* together. Do not partition (separate) units with earlier revisions.

Note: Exception – A NetRunner 75E Release 4.0 and later may be attached to an end point of a Release 3.2 network.



Note: Do not partition (separate) mesh units with non-mesh units.

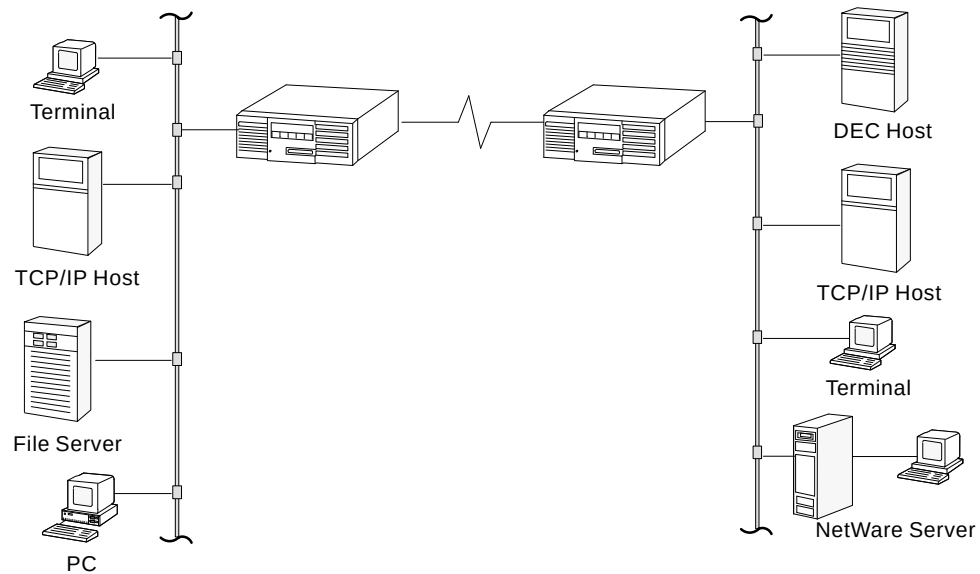
The example shows two mesh networks (A and B) connected by a single unit. In order for the two networks to communicate, the *connecting node(s)* must have mesh configured on (refer to page 3-9).



Point-to-Point

The most basic of topologies is the point-to-point: point A to point B. The NetRunners can operate in a point-to-point switching topology over terrestrial, satellite, and microwave services.

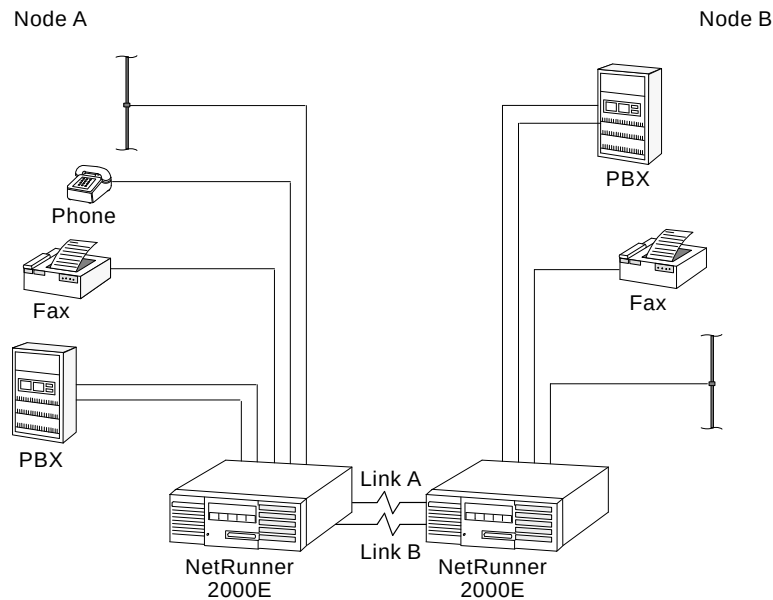
In a point-to-point application, a link is formed between two Integration Routers across a WAN network. Packets are forwarded between the two nodes. Filters may be set for specifying which types of packets each EasyRouter accepts or ignores.



Point-to-Point Operation

Dual Composite Link Load Balancing (with Redundancy) Application (for all NetRunner models except the NR75E model)

All WAN network link traffic between NetRunner nodes is load balanced between Link A and Link B. In the event of a single link failure, all traffic is automatically rerouted over the remaining link. Note that in this application with NetRunner 2000E units, dual 128 Kbps links are possible; however this link speed may limit the number or type of devices that can be attached due to processor constraints.

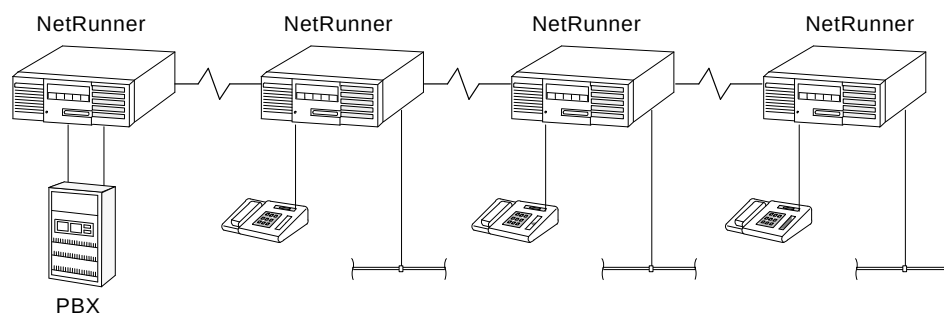


Link Load Balancing

String

If several NetRunner units are linked together, a string topology is created. There is a maximum of six node-to-node hops allowed for units with voice/fax modules.

Any or all of these may be NetRunner 500ET, 1000E or 2000E network node units. NetRunner 75E¹ can be at the ends of the string only.



Typical String Network

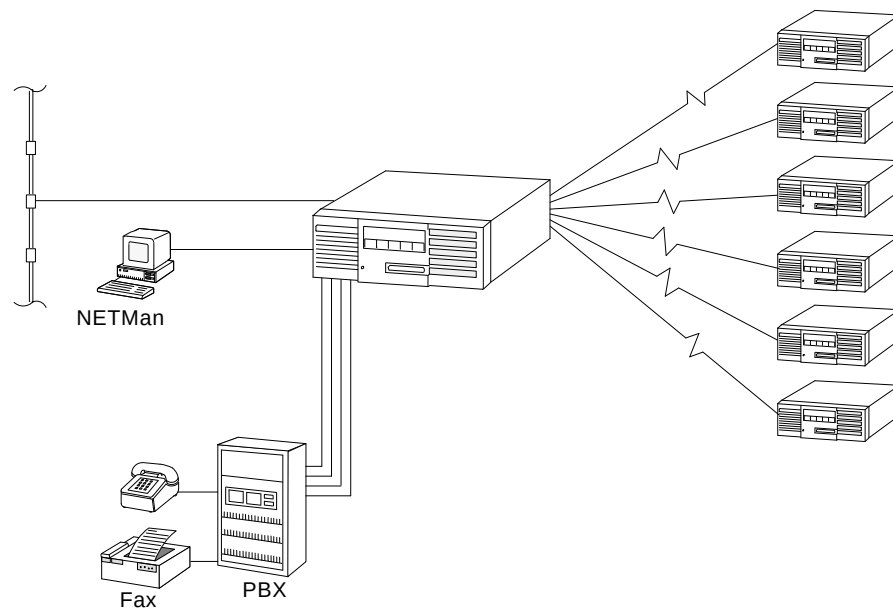
¹ The exception to this is frame relay links.

Star

The star topology is a network with a single major center connected to access points.

In a unit with the NetRunner 2000E or 1000E, the points of the star can all be NetRunner units. The NetRunner 2000E or 1000E can act as the network hub for up to 12 other NetRunner units. (The 5000E/6DMA Module must be installed in module location B to obtain the six additional links.) Each remote site NetRunner can support additional links to other NetRunner units.

In a star topology where a NetRunner 500ET is the central node, three links may connect to other NetRunner units.

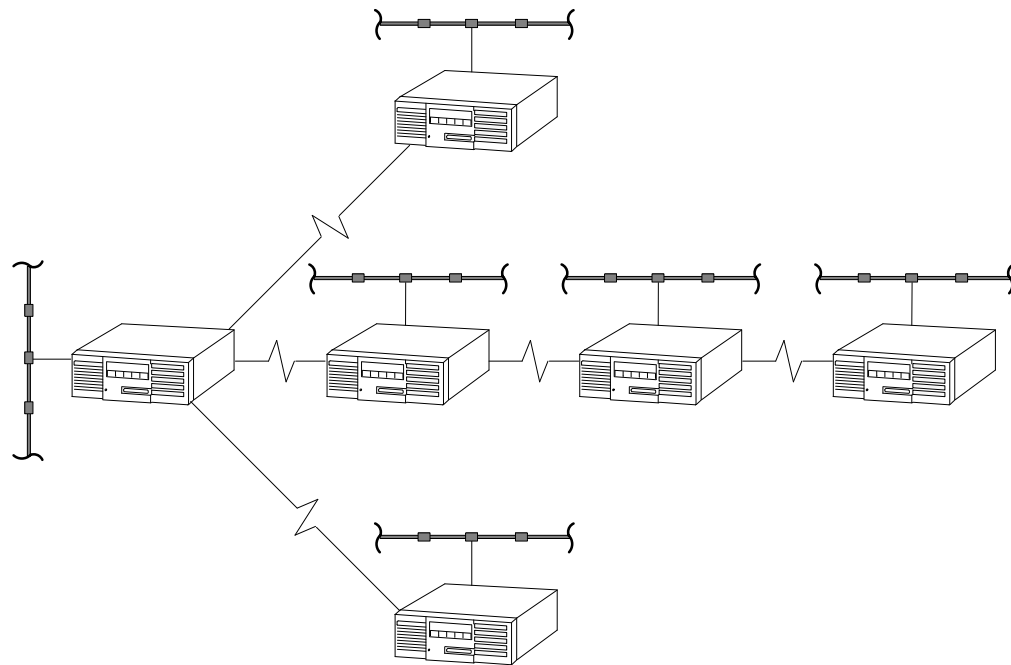


Typical Star Application

Multi-site

The NetRunner Release 3.0 and later, supports multi-site operation. Rather than a simple connection between only two NetRunners, and subsequently an interconnection between only two LANs, multi-site operation supports distributed LAN topologies, allowing interconnection between multiple NetRunners (see the example shown in the figure below). In addition, Integration Routers and NetRunner LAN interfaces may be grouped into clusters of up to 12, and clusters connected over a common LAN (refer to *Clusters* on page 2-12) so that both small and large wide area networks are supported.

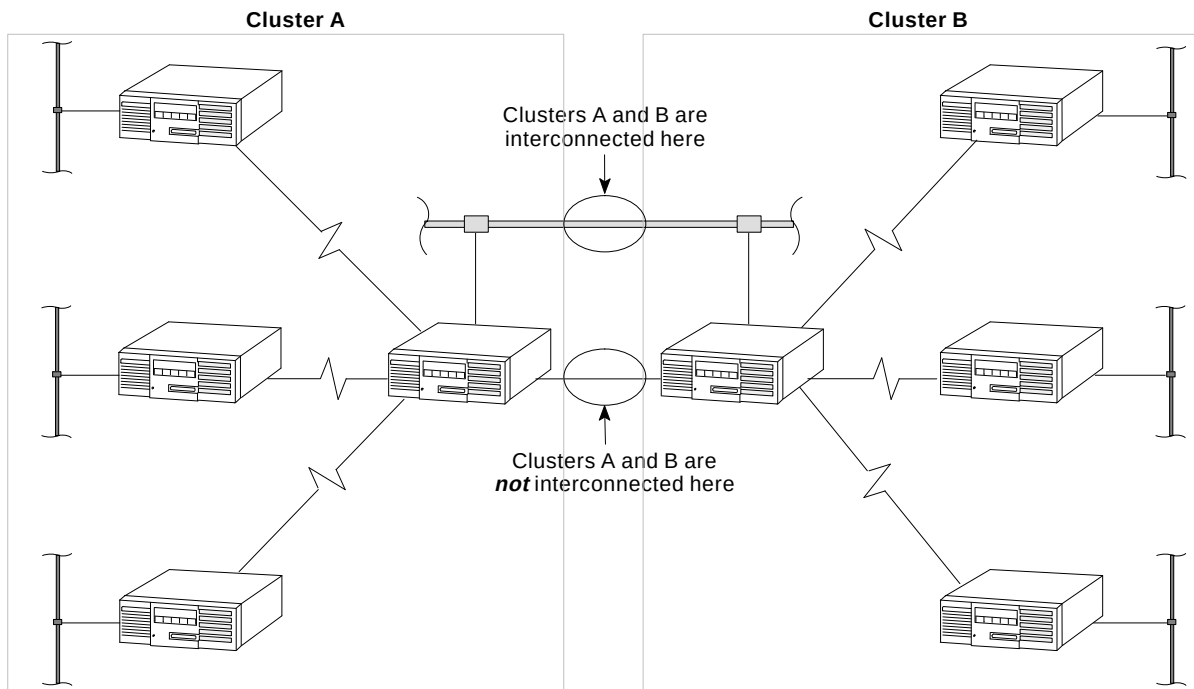
Refer to the Integration Router manual for more multi-site application information, such as *Filtering* and *The Spanning Tree*.



Multi-site Operation

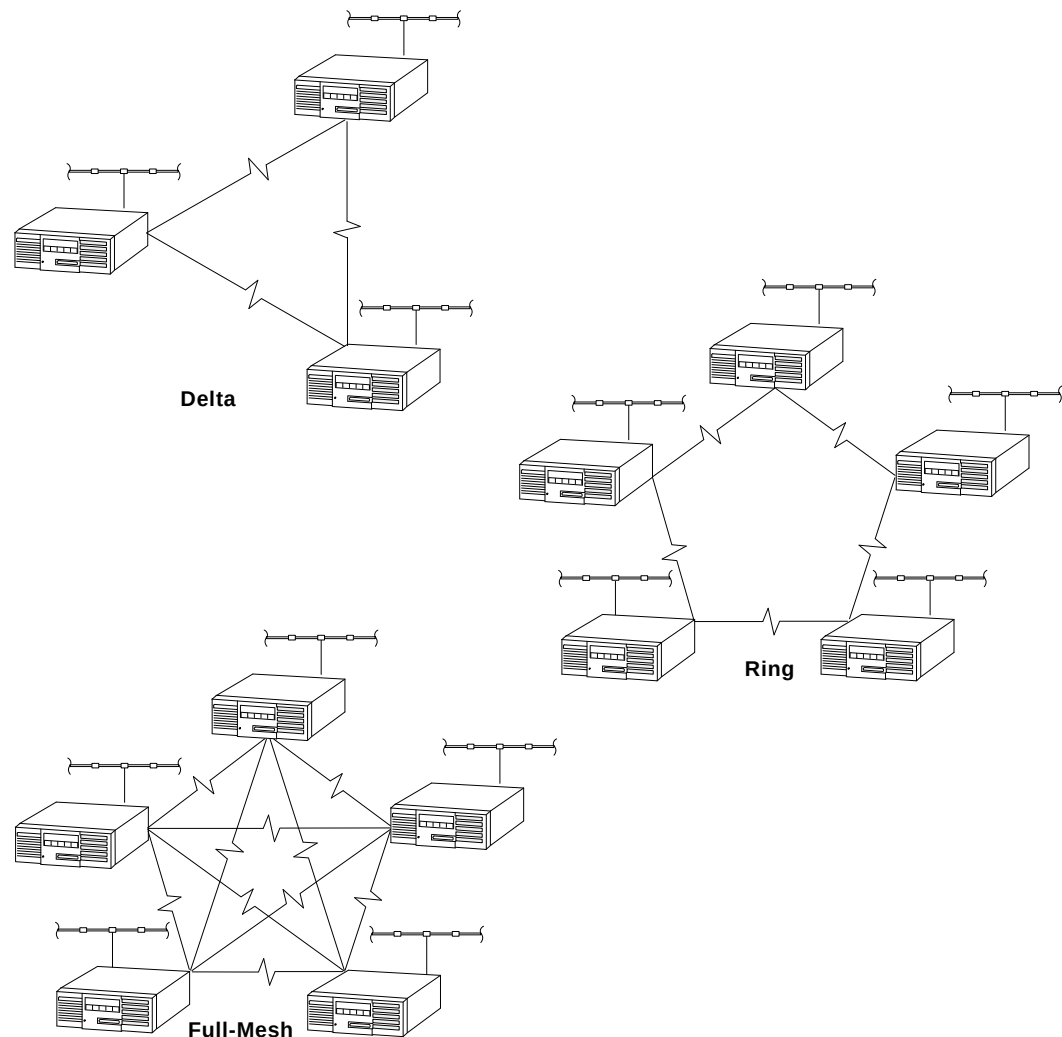
Distributed Star

If two or more star networks are connected, the topology can be described as a distributed star.



Delta, Ring and Full-Mesh

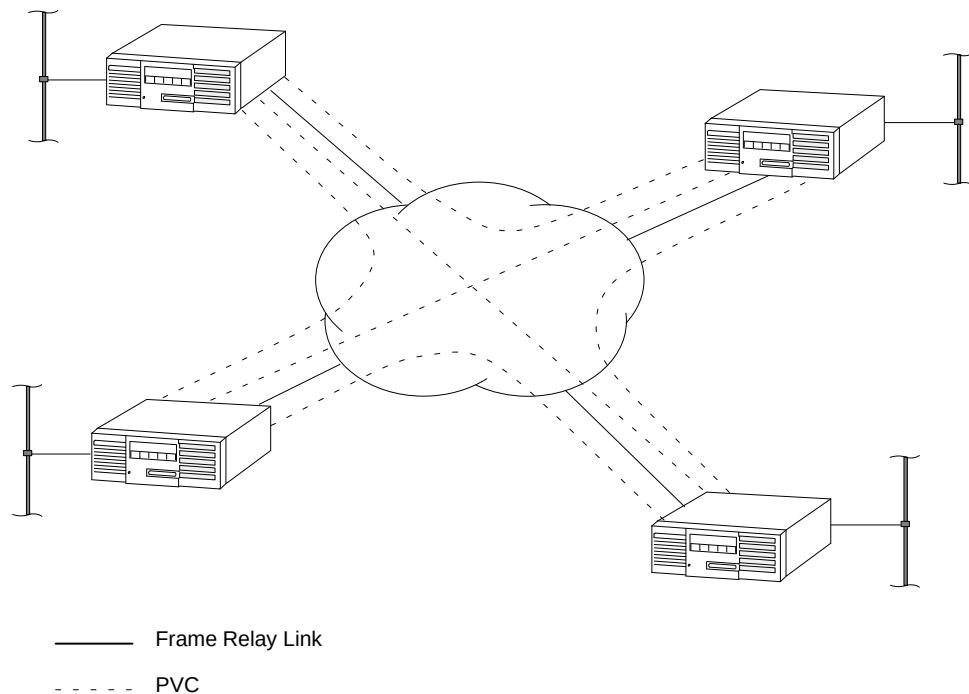
These topologies are common in that there are closed loops. As such, there is more than one path (link) available which offers network resiliency in the event of a link failure. The NetRunner 500ET, 1000E, 2000E and 2000ED Network Nodes are capable of working within these topologies. The NetRunner 75E model can be used as *feeders* into these networks. The Delta is the most basic of the mesh-type topologies; the Full-Mesh is the most complex. In creating networks with a closed loop or the full-mesh, it is always important to remember the cost and delay factor and use only the minimum links necessary to assure redundancy.



Delta, Ring and Full-Mesh Applications

Frame Relay

Public frame relay service offers you the benefits of leased line connectivity to multiple sites. In specific regions, frame relay is more economical than leased lines. This is because frame relay provides multiple permanent virtual circuits (PVCs) or data link connections (DLCs) within the same physical access line. This reduces to a single access line the multiple leased lines required to provide *any-to-any* communications among several locations. One physical connection into the public frame relay network logically provides the connectivity of a mesh network, although physically the network is a star topology.



Frame Relay Connectivity

Applications predominantly use frame relay services for local area networking (LAN) and/or Systems Network Architecture (SNA) inter-networking.

Planning Prerequisites

In addition to the topics about planning your network, you should consider the following:

- **Do you need to cluster your nodes?**

How many nodes are interconnected in your network? A network of up to 254 nodes can be designed. For networks consisting of more than 12 nodes, you will need to group nodes together in clusters. For networks with 12 or less nodes, clustering is optional. More information on clusters is explained on the next paragraph titled Clusters.

- **Note the LAN module's hardware address.**

The LAN module's hardware address is written on a label on the back panel of the LAN module. You may record this in the worksheets appendix, page A-1. For the NetRunner 75E, the hardware address is written on a label on the back panel of the LAN/WAN module.

- **Traditional IP routing considerations**

(Refer to the Integration Router manual, which contains more information on these prerequisites):

- Network addressing and subnetting. Acquire the necessary IP addresses from the Internet Authority.
- Node addressing. You must assign unique IP addresses to all the nodes on your network.
- Default gateways. There must be a default gateway (router) established.
- Domain Name Servers (DNS). Host tables that must be updated to reflect the new network architecture established by routing.
- Bootp. Any machine that requires Bootp during startup must either be on the same LAN segment as the Bootp host, or the Bootp host must be able to download Bootp through the Integration Router.

- **Traditional IPX routing considerations**

(Refer to the Integration Router manual which contains more information on these prerequisites):

- Unique network numbers for each LAN segment. (In bridged IPX networks, all LAN segments have the same network number.)
- All servers on a network segment must have unique network numbers, and these numbers must not be the same as any LAN segment network number.
- The WAN for all nodes in one cluster is considered as one virtual LAN segment. Thus, only one network number is required for the WAN.

- **What type of connection will be made to the LAN?**

For unshielded, twisted pair LANs, you can use the UTP port (8-pin modular jack). The NetRunner is then connected to a port on a twisted pair hub. For other LANs, you must use the AUI port along with an appropriate transceiver and transceiver cable.

The connections are described in the Integration Router manual. The connections for the NetRunner 75E are described in the 3-Slot Chassis Installation and Cabling Manual.

- **Will you be using a frame relay link?** The following information is needed from the carrier provider:
 - DLCI numbers and parameters
 - Network address
 - Local management protocol (Annex D, LMI Rev. 1, or none)
 - Local management parameters (for the protocol)
 - Type of interface required
(More information is provided on Frame Relay Links in Section 3).

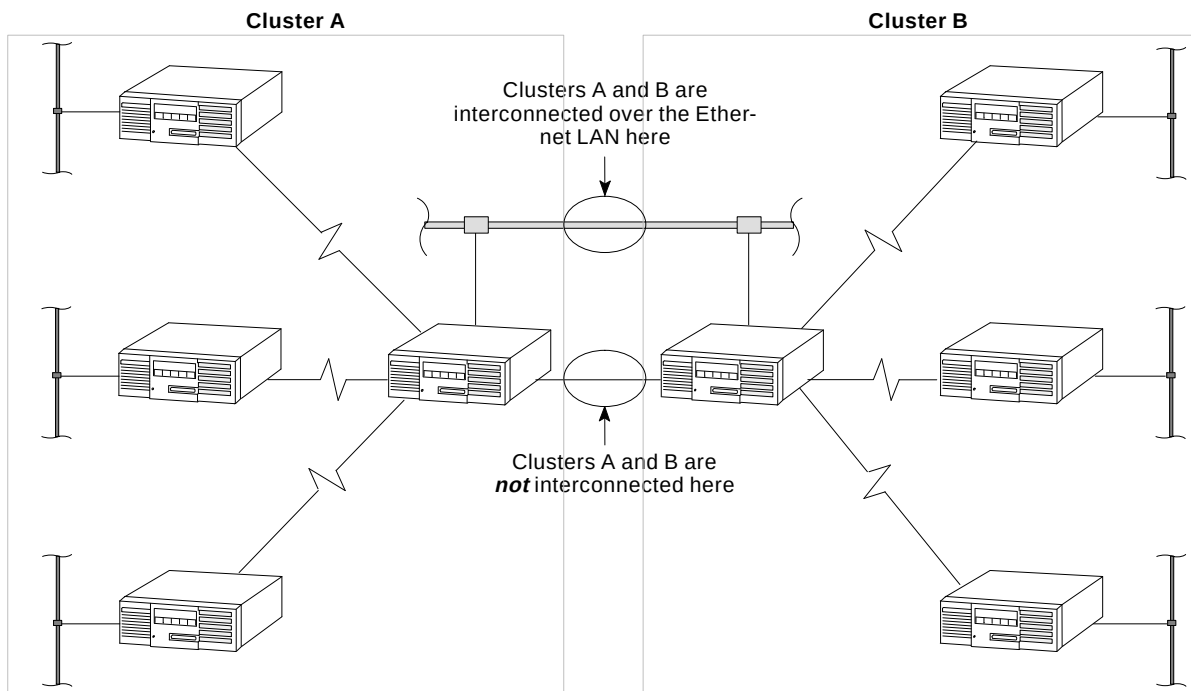
Clusters

The NetRunner allows a network to be partitioned into groups called clusters. A cluster is formed when two or more NetRunners are grouped together in the network and given the same cluster name. A single cluster may contain up to 12 interconnected NetRunners on a WAN. Configuring multiple clusters allows you to create a WAN exceeding 12 nodes, up to a maximum of 254 NetRunner units per WAN.

All NetRunners are shipped with the same cluster name <none>. The cluster name is user-configured.

Clustering, as mentioned here, allows you to efficiently expand your network. A cluster segments the network to improve performance and maximize bandwidth for LAN traffic. This is especially true in larger networks consisting of more than 12 NetRunners. It also secures portions of a network by allowing communication only between NetRunners with the same cluster name.

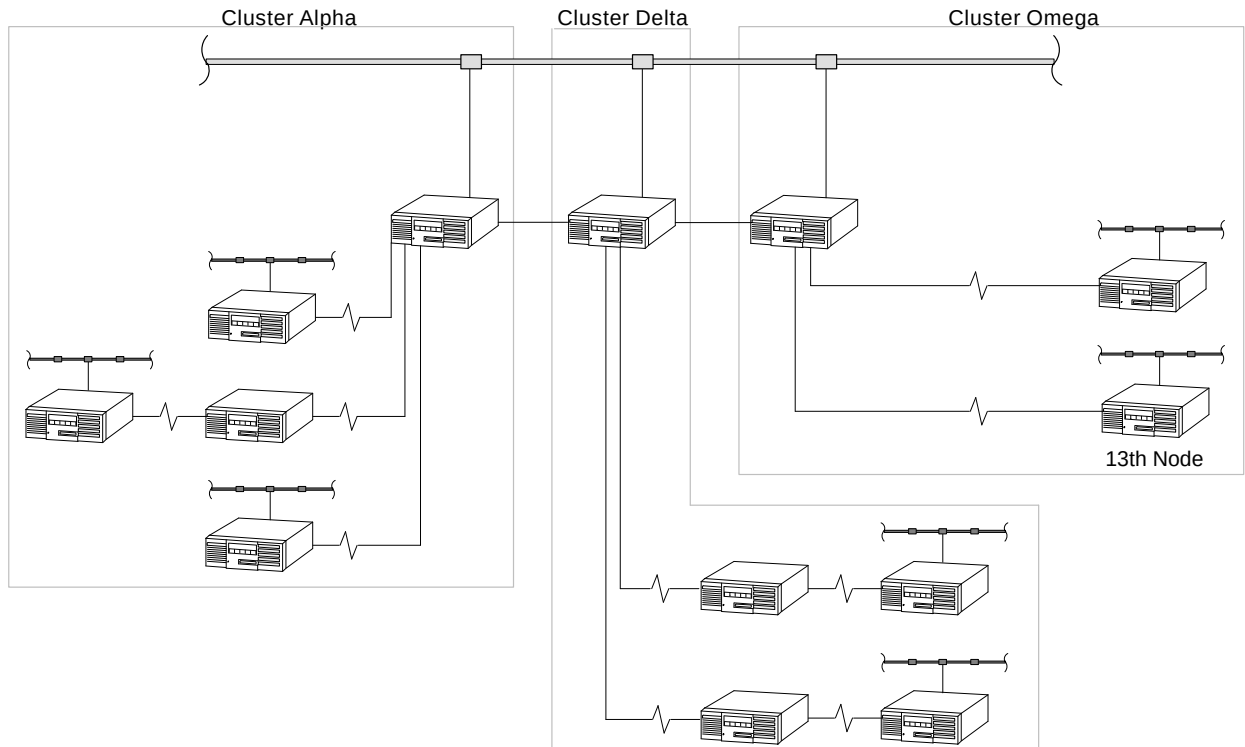
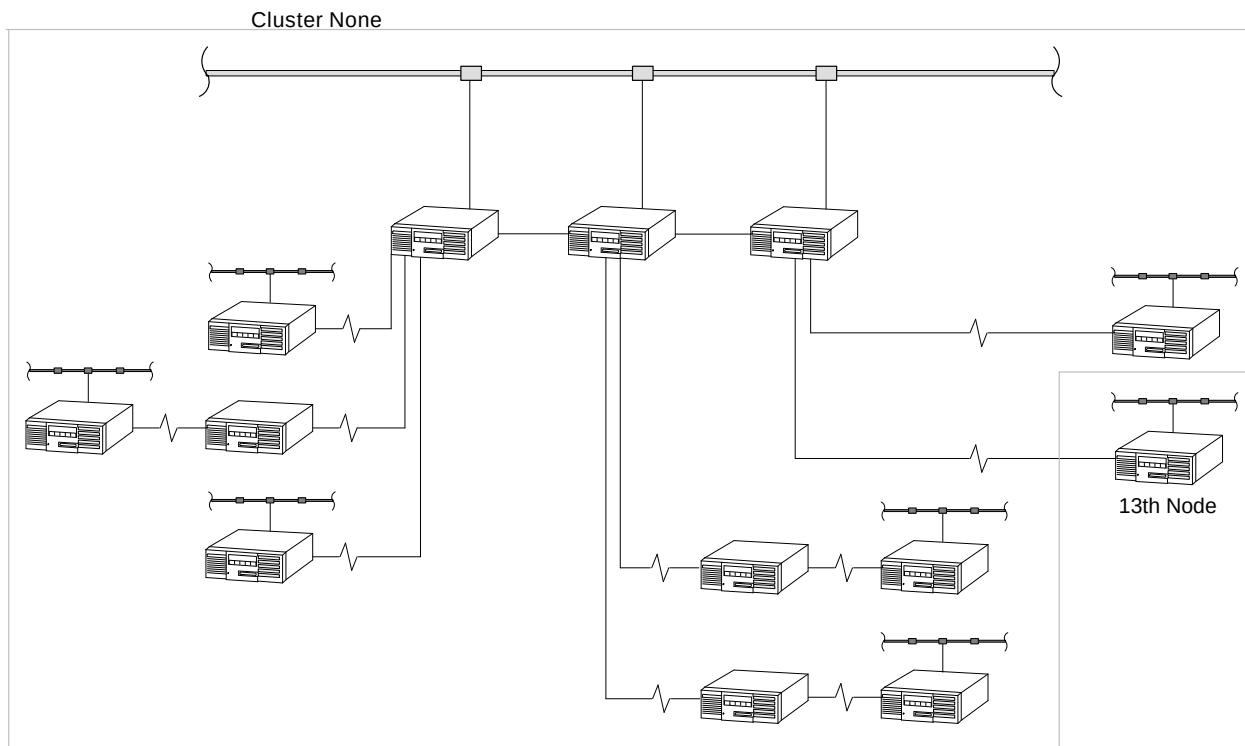
Clusters can only be interconnected over a LAN.



Local Cluster Interconnection

- Each NetRunner may belong to only one cluster. (NetRunner models containing two LAN modules count as two nodes. The two LAN modules can be assigned to one cluster and count as two nodes in that cluster, or they can each be assigned to different clusters – and count as one node in each cluster.)
- A new NetRunner will only attempt connection via the WAN with other NetRunners assigned to the default cluster name of None. To connect a new NetRunner to a different cluster, its cluster name needs to be changed. This procedure is described in the Integration Router manual.
- Each cluster may consist of up to 12 interconnected NetRunners. For example, if you connect a new NetRunner to a WAN with 12 nodes already in place, a request for connection by the new NetRunner will be ignored, as each node's address table already holds the maximum of 11 other node addresses.

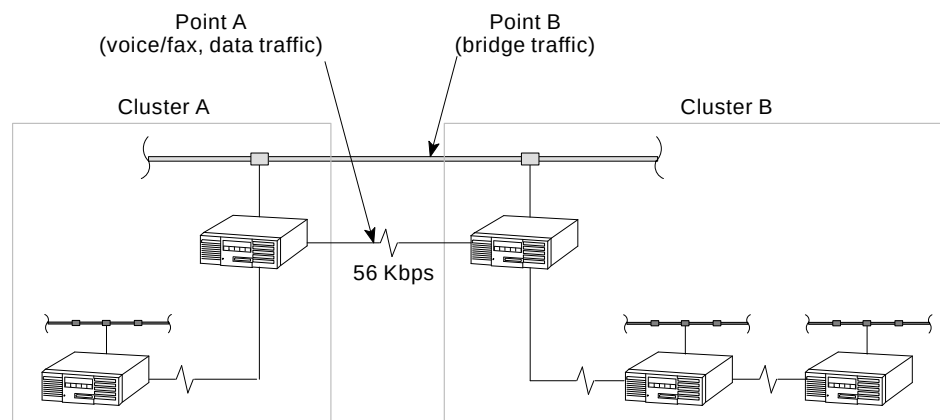
To add the new node to the network, the original 12 nodes need to be partitioned into smaller clusters and the new NetRunner assigned to one cluster or another. This is illustrated in the following figures.

**Connecting a 13th NetRunner Node to Existing Clusters**

Communicating Between Clusters

Clusters increase network efficiency by separating LAN traffic from voice/fax and data traffic.

As an example, refer to the figure below. Though the two clusters shown are connected through a 56 Kbps WAN network link (point A), the link only carries voice/fax and data traffic. LAN traffic between the clusters passes through the common LAN at point B. Once inside a particular cluster, LAN traffic is then forwarded over the WAN links of the particular cluster. Connecting clusters in this manner increases overall network performance and adds additional network security, as nodes in a particular cluster may be set to forward or accept only certain packet types (filtering).



Cluster-to-Cluster Communication

Planning the NetRunner Node Numbers and Node IDs

Each NetRunner is referred to as a node. All nodes connected locally are considered local.

All nodes on the other side of a WAN network link are considered remote.

Each node must have its own node number and node ID, and there can be no duplicates in the network. (Sometimes node IDs are referred to as node names.)

The node assigned the lowest node number and which contains a Real Time Clock (RTC) device is the network time master. It broadcasts time, day and date to the other nodes in the network.

The LAN node ID is automatically assigned by the LAN interfaces while they are communicating to each other.

Syntax

WAN network links are called interconnect links in the software.

NODE # Use 1 through 254.

NODE ID One to eight uppercase or lowercase characters. The first character must be an alpha character. The remaining characters can be any combination of alphanumeric characters and the underbar (_). Spaces can not be used. Node IDs are not case sensitive. It is recommended that they be kept short.

Channel Prioritization on Interconnect Links

By default, integral voice/fax channels have priority for transmission across the interconnect (WAN network) link followed by sync, and then LAN and async data. This priority scheme minimizes delay for voice/fax and sync connections. There are occasions when a sync channel may need to have bandwidth priority over voice/fax. To accomplish this, it is necessary to configure the sync channel (both local and remote ports) for high priority (option number varies depending on protocol, refer to page 5-7 and Table C-7 on page C-12), and the voice/fax channel for low priority (refer to the voice/fax manual). For sync and voice/fax channels to have equal priority, set them both for high priority.

Note: A sync channel(s) configured as TDM protocol has reserved bandwidth which is not shared. The priority function noted above does not apply to channel(s) configured for TDM.

Startup 3

At this point, the following should be completed:

- LAN cables should be installed (refer to the Integration Router manual)
- NetRunner FlashPak or FEATUREPAK cartridges should be installed and the unit powered up per the Installation and Cabling manual.

This section introduces the Command Mode and Command Facility and configuring a local node number and node ID (name) for the NetRunner node. This configuration is required and prevents duplication of the node IDs in the node network.

The Command Mode is a single menu which supports configuration and testing of the local port and access to the Command Facility.

The Command Facility contains the parameters that control the features and functions for the NetRunner. In the Command Facility, parameters remain at their most recently set values. The optional Command Facility Reference Guide documents each menu and option within the Command Mode and Command Facility.

Note: The NetRunner Command Facility menus do not contain the commands for configuring the LAN. Rather, they provide a means to access the LAN's own command line interface from the Command Facility.

Refer to the Integration Router manual for the LAN procedures and commands.

Command Mode

Connect an ASCII terminal, or a PC with terminal emulation software, to any asynchronous channel in the unit. This terminal will provide access to the NetRunner Command Mode and Command Facility until you define a server name and address. After these have been defined, you can access the NetRunner from the LAN.

Entering the Command Mode

The Command Mode is accessible from any of the async ports local to that CCM.

First Time

Access to the

Command Mode: Set the terminal to the settings shown below.

Async Terminal Settings

Data Rate	9600
Code Level	8 bits per character
Stop Bits	1
Parity	None
Operation	Full-Duplex

After the initial connection to the Command Mode, the terminal parameters (except Operation) may be reconfigured. Once the new parameters are selected, exit the Command Mode by entering **<break>**. The new parameters will now be in effect. Set the terminal to the new parameters and reenter the Command Mode, if desired.

**To Enter
Command Mode**

Press ^X
then <break>

The Command Mode Menu is displayed.

```
1996 MICOM COMMUNICATIONS CORP.  
ALL RIGHTS RESERVED  
UNPUBLISHED - RIGHTS RESERVED UNDER THE  
COPYRIGHT LAWS OF THE UNITED STATES.  
  
COMMAND MODE: CHANNEL  
  
1. ASYNC CHANNEL LOOPBACK  
2. LOCAL CHANNEL CONFIGURATION  
3. COMMAND FACILITY MAIN MENU  
4. EXIT
```

The Command Mode offers four options:

- Async Channel Loopback: Contains a selection of loopback tests.
- Local Channel Configuration: Provides control and modification of the local port only.
- Command Facility Main Menu: Provides access to the local unit's Command Facility.

```
ENTER PASSWORD: <cr>
```

- Exit: Disconnects the terminal from the Command Mode.

**To Exit
Command Mode**

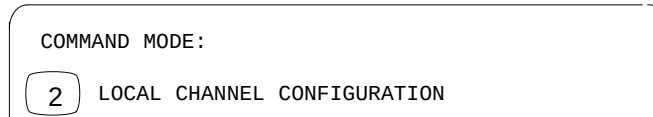
Either

- select option 4, Exit, or
- press <break>.

The COMMAND MODE DISCONNECT message is displayed.

Local Channel Configuration

Intended for changing parameters on the port to which you are attached, use the following path to access the menu.



Option	Default	Description
1. Data Rate	9600	Data rate in bps (bits per second).
2. Code Level	8	Number of data bits per character.
3. Parity	None	Depending on code level chosen, one of two menus will appear.
4. Stop Bits	1	Number of stop bits inserted at the end of a data character.
5. Echo	Off	Turns the echo function on or off.
6. CR Delay ¹	0	Carriage return delay.
7. LF Delay ¹	0	Line feed delay.
8. FF Delay ¹	0	Form feed delay.

Note: To ascertain the correct configuration values, consult the user manual of the device connected to the port.

For ports connected via dial-up modems, parameters remain in effect only for the duration of the call.

For directly connected ports, the parameter changes remain in effect until changed in this menu or in the Channel Characteristics (of the Async Channel) Menu.

Important

Be sure your terminal is reconfigured to match the new local channel configuration.

¹ Delay values are configured in number of characters (0-99) to account for required mechanical actions of the equipment attached to the port.

Command Facility

The Command Facility is intended for use by the system administrator. It contains the configuration, diagnostic and system administration options for all ports of the unit. Only one port may access the Command Facility at a time.

Note: The terminal accessing the Command Facility Main Menu must have the Command Facility Main Menu Access function enabled (factory default).

To Enter

Command Facility

Either

Access via \$CMD

Press <cr> 
At the prompt¹, enter \$CMD.

ENTER CLASS: \$CMD

ENTER CLASS PASSWORD: <cr>

The default Global password is no password, so press <cr>.

Access via ^X <break>

Press ^X
then <break>

COMMAND MODE:

 COMMAND FACILITY MAIN MENU

COMMAND FACILITY MAIN MENU [!240]

1. VIEW CONFIGURATION
2. STATUS/STATISTICS
3. CONFIGURE LOCAL NODES
4. CONFIGURE/VIEW REMOTE NODE

.

.

.

 EXIT COMMAND FACILITY

Exit option varies
depending on model.

To Exit

Command Facility

Either,

- select the Exit option
- or
- press <break>.

¹ The Enter Class Prompt is a configurable dialog message. If it has not been configured as a different message, the factory default will display ENTER CLASS:.

Configure Local Node

Exit option varies
depending on model.

COMMAND FACILITY MAIN MENU [!240]

1. VIEW CONFIGURATION
2. STATUS/STATISTICS
3. CONFIGURE LOCAL NODES
- .
- .



EXIT COMMAND FACILITY

Each NetRunner is referred to as a node. Each node in the network must have its own node number and node ID. There can be no duplicates in the system. The node numbers and IDs (names) are used during all the configuration processes to identify which NetRunner you are configuring.

Node Syntax Information

Worksheets are provided in Appendix A for recording the node numbers¹ and node IDs for the NetRunner units in your network.

Node Number Syntax	Node numbers may be 1 through 254. It is not necessary to place 0s to hold spaces; the number 1 is input as 1 and not 001. (The default is 240.)
Node ID (Name) Syntax	Node names may be up to eight characters long. Only alpha characters (a-z, A-Z), numeric characters (0-9), and the underbar symbol (_) can be used. The first character must be an alpha character. Names are not case sensitive; therefore New_York, new_york, and NEW_YORK are the same name. Spaces cannot be used in node names. (The default is !240.) It is recommended that the node ID be kept short for ease of operation.

¹ If you have an NMS module, the node number and node ID may be programmed by switches (refer to the NMS Manual).

Node Numbering and Naming from the Command Facility

To configure new node numbers and node IDs, follow this path of selections through the menus. This process is sometimes referred to as “naming” the node. A reset is required after this part of the configuration process. The reset updates the network with the new node number and node ID.

COMMAND FACILITY MAIN MENU [!240]

3 CONFIGURE LOCAL NODES

CONFIGURE LOCAL NODES [!240]

NODE IDS

NODE ID CONFIGURATION

1 LOCAL NODE

ENTER NODE-ID # [240]: 101

Enter the node number you planned for the local NetRunner unit. For example, 101

ENTER NODE-ID (^X TO ABORT) [!240]: Los_A

Enter the planned node ID. The NetRunner software is not case-sensitive, so for example, Los_A, LOS_A and los_a are all the same.

SELECT “Y” TO RESET SYSTEM WHEN NODE CHANGES MADE

ENTER “Y” TO RESET “C” TO CONTINUE: Y

Press Y, which will force the reset and complete the node configuration process, or you may press C which will return you to the Node IDs menu. If you select C, your configuration is placed into temporary storage and not implemented.


CAUTION

To implement the node ID configurations, you must select Y before leaving the Node ID Configuration menu or your new configuration will be lost.

Do not reset via the LCD/Keypad. You must select the node reset with a Y to set the new node ID.

Channel Syntax Information

Channel Number Syntax	Channel numbers are assigned to <i>all</i> the ports on the local unit. The CCM module is always module location A and it has six (6) connectors (except the NetRunner 75E which has four). From left to right these are numbered sequentially (1-6). The channel numbers correspond to the module and connector locations (ports). The same is true for all the other modules except the LAN Module which has no individual ports. The first connector, regardless of the type, on the left side is connector number 1. If this connector is on the module in location B, the channel number is B1. If the connector is on module C, the channel number is C1, and so forth.
MICOM Mux Channel Syntax	MICOM mux ports are numbered 1 up to 32 sequentially.
Node ID/Channel # Syntax	Node ID, a slash, and the channel number. The slash, a separator (delimiter) between the node ID and channel, <i>must</i> be there. (Examples: NEW_YORK/A5 is port 5 of module A on the new_york node. DALLAS/10 is port 10 on the dallas MICOM-mux node.)
Range of Channels Syntax	You may access more than one port on the same node. To access a specified range of channels (C4-D8) on the unit identified by the ID of NODE_A, you would type the following:

NODE_A/C4-D8

Note: In all cases, the input syntax is not case sensitive.

Configuring a Mesh Node

There are two network types: mesh and non-mesh.

- **Non-Mesh (Mesh Off)** Recommended for all units operating without closed loops. This is the default.
- **Mesh (Mesh On)** For all units utilizing a closed-loop topology (connected in a network with more than one pathway) and units in between closed loop networks.

Each unit required to run mesh or connecting units between mesh networks must have mesh enabled (on).

When configuring mesh, it is required that you start on a hub unit (central unit) and then work out to the edges of the network without skipping any unit in the direct path (no mesh units may be separated by a non-mesh unit). The units may remain connected, but the network traffic will be interrupted until the units are properly configured and reset.

Your unit must have either

- at least one link configured as frame relay
- more than one interconnect link configured

To enable the mesh feature, use the following path:

Option numbers vary depending on the model.

CONFIGURE LOCAL NODES

☐

NODE IDS

NODE ID CONFIGURATION

☒

3 MESH ROUTER

MESH ROUTER

☒

1 ON

ENTER "Y" TO RESET "C" TO CONTINUE:

Press Y which will force the reset. If you select C the change will not take effect.

Important

The DUPLICATE NODE-ID message will *very briefly* display if there are units within the network which should be configured for mesh, and they are currently configured as non-mesh. (This is assuming that all the nodes have already been given unique names at the Node IDs Menu.) Do not place a network in service that displays this message as some nodes may not be recognized.

Real Time Clock

Administrative Functions

The Real Time Clock device allows you to set and control time-specific events for the entire network using one clock. This has the advantage of not needing to interpret multiple time zones for specific events. Call accounting records can have one system time for better assessment and evaluation.

The Real Time Clock system works in conjunction with other valuable time-related features such as Bandwidth on Demand. The Real Time Clock allows setting secondary and primary link operations during specific hours on specific days of the week. For example, you can schedule a time when a link can be brought up or shut down. (Bandwidth on Demand features are described on page 4-9.)

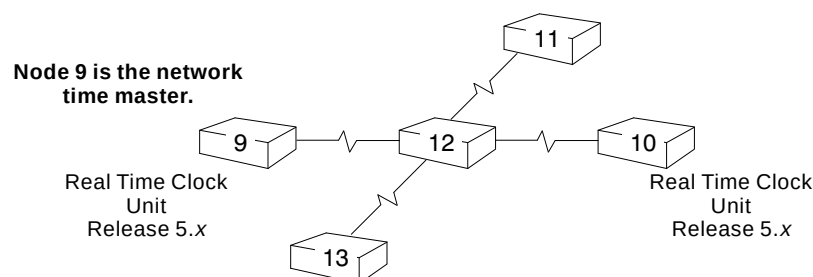
Characteristics

- The clock source maintains network time automatically by broadcasting Time message every two minutes.
- Every unit (with or without a Real Time Clock device) in the network sets its clock to the specified time.
- A hierarchy of units containing Real Time Clocks is determined by the unit's node number. The unit with the lowest node number is the network time master.
- Other sites may also have real time clocks, and the unit with the next lowest node number assumes control in the event that the master fails.

Network Time Master

The unit with the lowest node number in the network and which has a Real Time Clock is the network time master. This unit broadcasts its time to the entire network at two-minute intervals. A Time broadcast includes Time, Date, and Day of the Week settings.

Any units featuring Real Time Clocks provide network time redundancy.



Reset's Effect on Network Time

Reset – Non-Real Time Clock Unit

After a reset, a unit without a Real Time Clock resets its time to 00:00:00. In order to synchronize itself with the rest of the network, it immediately requests a time update. This request is repeated each time on a different link (if there is more than one). The request starts on link A1.

If the adjacent unit is synchronized with the network, it responds with the time and date. This allows the reset unit to synchronize with the network.

If the reset node has bandwidth on time of day restrictions on bringing up its only link, the link will be brought up for the purpose of retrieving network time. The link is then dropped if the bandwidth on time of day configuration indicates that the link should be down.

Reset – Real Time Clock Unit

After a reset or link down condition, a unit with a Real Time Clock waits several minutes for a network time broadcast. When the broadcast is received, it sets its own clock. If the broadcast came from a unit with a higher node number, the reset unit takes over as the network time master and begins broadcasting time.

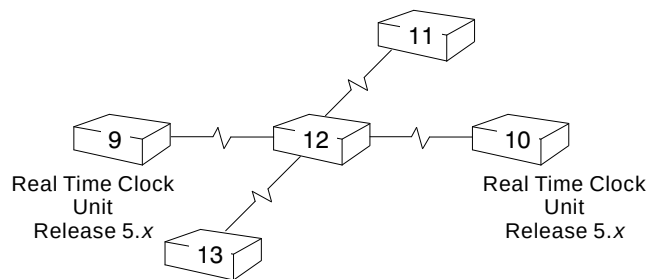
If the reset unit does not receive a time broadcast, it assumes it is the network time master and begins broadcasting time.

Node 10 broadcasts time

Node 9 sets its clock.

Determines its node number is lower.

Node 9 becomes the network time master.



Configuration

There are three parameters associated with the Real Time Clock that require configuration:

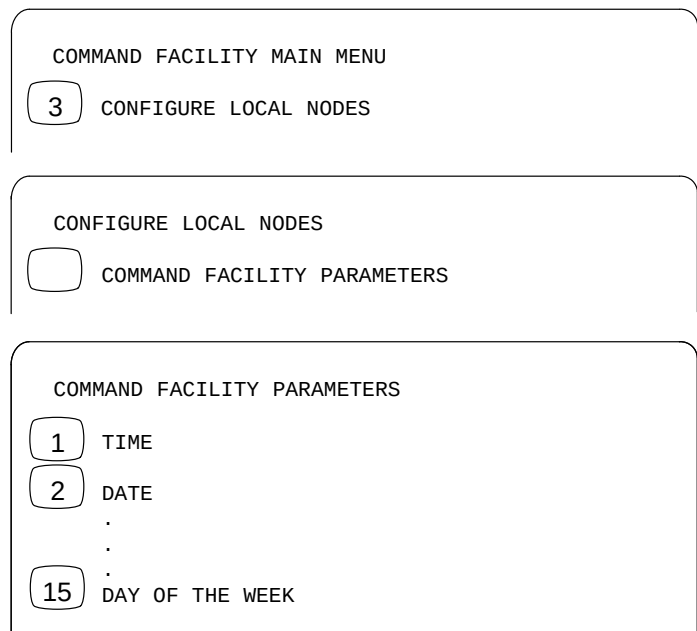
- Time
- Date
- Day of the week

When time is set at any network unit, the time and date are broadcast and immediately become the network time and date. Any unit, including those with a Real Time Clock sets its clock when it receives a Time broadcast.

A unit with the Real Time Clock source is always considered a valid source of network time once time has been set.

Access the Command Facility Main Menu, and follow this menu path to the Command Facility Parameters menu:

Option number is not shown here, because it may vary between models.



Time Configuration

Time is set in 24-hour time, so 1:00 p.m. should be entered as 13:00:00.

Date Configuration

The date is entered as mm/dd/yy [month/day/year].

Day of the Week Configuration

This configuration sets the day of the week, and operates in conjunction with the time and date settings. This selection also supports a feature referred to as Bandwidth on Demand. (The Bandwidth on Demand feature is discussed on page 4-9.)

COMMAND FACILITY PARAMETERS

15 DAY OF THE WEEK

EVERY DAY OF THE WEEK [SATURDAY]

1. SUNDAY
2. MONDAY
3. TUESDAY
4. WEDNESDAY
5. THURSDAY
6. FRIDAY
7. SATURDAY

ENTER:

Link and Port Configuration 4

Port Configuration

The CCM port defaults vary depending on the NetRunner model number and the port number. See the table beginning on page 4-3, for the port default and options.

Follow this menu path to assign a particular channel or link type to a port.

	COMMAND FACILITY MAIN MENU [node ID] 3 CONFIGURE LOCAL NODES
	1 PORT CONFIGURATION
Type the node ID, a slash, followed by the channel number. Then press <cr>.	ENTER NODE-ID/CHANNEL # (^X TO ABORT):
Select the port type for the channel. Option numbers may vary depending on the model.	PORT CONFIGURATION [port type] 1. ASYNC 2. SYNC 3. INTERCONNECT LINK 4. LOCAL INTERCONNECT LINK 5. SECONDARY INTERCONNECT LINK 6. MUX LINK 7. X.21 LINK 8. FRAME RELAY LINK

Option	Description
Async	For all async data channels.
Sync	For all sync data channels.
Interconnect Link	For connection to another Integration unit.
Local Interconnect Link	For connection to another Integration unit (NetRunner 2000E, 2000ED, 1000E or 500ET) within close proximity (25 feet).
Secondary Interconnect Link	Configured as a back-up link to another Interconnect Link.
Mux Link	An infrequently used connection to a MICOM mux over a leased line.
X.21 Link	An infrequently used connection to a MICOM mux over an X.21 link.
Frame Relay Link	For connecting to a frame relay service. Note: The total number of DLCIs and links (all types) varies depending on model.

Important

The NetRunner **must** be node reset (to *current configuration*) after port configuration is complete.

COMMAND FACILITY MAIN MENU [node ID]

10

RESET

RESET [node ID]

1

NODE

ENTER A "Y" TO CONFIRM OR "N" TO ABORT: Y

PARAMETER RESTORATION

2

CURRENT CONFIGURATION

Be sure to select option 2, Current Configuration.

Port Defaults and Options

Port (Channel) Number	Default	Possible Port Configuration
NR2000E, NR2000ED and NR1000E		
A1	Interconnect Link	Interconnect, Local Interconnect, Secondary Interconnect, Frame Relay, Mux or X.21 Link
A2-A5	Async	Interconnect, Local Interconnect, Secondary Interconnect, Frame Relay, Mux or X.21 Link; Async or Sync
A6	Async	Interconnect, Local Interconnect, Secondary Interconnect, Frame Relay Link; Async or Sync
B1-B6 ¹	Async	Interconnect, Local Interconnect, Secondary Interconnect Link, Async or Sync
B1 and above	Async	Async or Sync ²
NR500ET		
A1	Interconnect Link	Interconnect, Local Interconnect, Secondary Interconnect, Frame Relay, Mux or X.21 Link
A2	Async	Interconnect, Local Interconnect, Secondary Interconnect, Frame Relay, Mux or X.21 Link; Async or Sync
A3	Async	Interconnect ³ , Secondary Interconnect, Frame Relay, Mux or X.21 Link; Async or Sync
A4	Async	Secondary Interconnect, Frame Relay, Mux or X.21 Link; Async or Sync
A5	Async	Mux or X.21 Link; Async or Sync
A6	Async	Async or Sync
B1 and above	Async	Async or Sync ²
¹ Only with the 5000E/6DMA Module installed in module location B. ² Sync channel available only on the 5000E/6 (and 5000E/6DMA for NR2000E,ED, and NR1000E). ³ If A1 and A2 are utilizing 56-64 Kbps link bandwidth, A3 must use a rate not to exceed 19.2 Kbps. Do not exceed 148 Kbps total link bandwidth.		

Port Defaults and Options (cont'd)

Port (Channel) Number	Default	Possible Port Configuration
NR75E		
A1	Interconnect Link	Interconnect, Frame Relay, Mux or X.21 Link
A2	Async	Secondary Interconnect ¹ , Frame Relay Link; Async or Sync ²
A3	Async	Async or Sync ²
A4	Async	To be used as a Command Port, although not dedicated
B1-C12	Async	Async
¹ Port A2 may be configured as an interconnect link for connection to a secondary interconnect link at the remote end. This link will activate only if the link on A1 is non-operational. ² Either A2 or A3 may be sync. Only one port at a time may operate sync. If A2 is configured for sync, then A3 cannot be configured for sync, and vice versa.		

Port Considerations

- For optimal performance, highest speed Wide Area Network links (interconnect, local interconnect, secondary interconnect, and frame relay) should be configured on the lower-most channels (i.e., A1, A2) followed by low-speed WAN links, then mux links, X.21 links, and data channels (sync, async, voice and LAN). Exceptions are as follows:
 - If an integral DSU/CSU is installed in the chassis, it will map to A1 and/or A2, forcing high speed WAN links to A3 and higher.
 - If WAN links are configured on the 5000E/6DMA module, they must not exceed the available aggregate. In this case, WAN links may follow mux links.
- If your network contains two NetRunners located in close proximity (co-located), configure a port on each unit as a local interconnect link. (This is not applicable to the NR50EF and NR75E models.)
- If any of your ports are to be used as a backup link to an interconnect link, configure the port as a secondary interconnect link.

- If any of the ports A1 through A5 are to be connected to a MICOM mux over a leased line, then the port needs to be reconfigured as a mux link. A list of compatible muxes follows:

MICOM Mux Compatibility

Mux	FEATUREPAK Cartridge	PROM No. and Revision
MB2	ESM	907-1911-0F or higher
	FSM	907-2102-0A or higher
	FSV	907-2120-0B or higher
		907-2157-0A or higher
MB3	ESS	907-2002-0G or higher
	FSS	907-2103-0C or higher
MB5	ESM	907-1992-0B or higher
	ESS	907-1993-0D or higher
	FSS	907-2105-0B or higher
LCi/Val-U-Mux ¹	n/a	907-2013-0A or higher

¹ Will not support X.21 bis application.

- If any of the ports A1 through A5 are intended for connection to a MICOM mux through an X.21 bis network, the port needs to be configured as an X.21 link. The clocking source is external. This is a *pay as you go* link. It is established on demand, and is for data only.
- If your network requires sync channels, then not only must the port be configured as a sync port but also its operating protocol must be selected (see page 5-3).

Interconnect Link

The Interconnect Link (a Wide Area Network link) is for connection to another NetRunner unit at a remote location. (An alternative connection is a Frame Relay Link, see page 4-23). When the option is selected from the Port Configuration Menu, the Interconnect Link menu displays with the following clocking options:

```

PORT CONFIGURATION
3 INTERCONNECT LINK

SET LINK RATE
1. Sync External Clocks
2. 2400 Sync Internal Clocks
3. 4800 Sync Internal Clocks
4. 9600 Sync Internal Clocks
.
.
.
11. 64000 Sync Internal Clocks
  
```

For most applications you will select Sync External Clocks. This is used when connecting to another NetRunner across a link via a communications device.

Options 2-11 set the data rate if you are connecting the NetRunner back-to-back in close proximity (without a communication device) or for providing clocking to a device (such as a channel bank). These options are rarely used.

Reset the unit.

```

COMMAND FACILITY MAIN MENU
10 RESET

RESET [node ID]
1 NODE

ENTER A "Y" TO CONFIRM OR "N" TO ABORT: Y
  
```

Be sure to select option 2, Current Configuration.

```

PARAMETER RESTORATION
2 CURRENT CONFIGURATION
  
```

Local Interconnect Link

The local interconnect link feature permits you to connect two or more NetRunner units located within a close proximity (co-located). These units may be a NetRunner 500ET, 1000E¹ or 2000E,ED. This particular link increases backbone capacity for critical applications such as voice switching.

- One half of the configured bandwidth is available for rated traffic (voice and sync data); the remaining bandwidth is reserved for unrated traffic (LAN or async). The maximum amount of composite utilization will never exceed 87% (as viewed in the Demand Report).
- When using a MICOM cable, the distance between units should not exceed 25 feet (8 meters) on higher data rates when internally clocked. Shorter distances may be required when using other cables or when externally clocked.
- If utilizing a campus-type private wire application, you may connect a communications device and configure for external clocking. In this application, additional cable length restrictions may apply depending on devices and cables. High speed converters may be required.
- On units with terminated traffic (directly attached terminals, hosts, voice/fax modules) it is recommended that the local interconnect links (at 252 Kbps) be restricted to two links.
- *Do not use local interconnect links for WAN link communications; the NetRunner does not support that application.*
- Load sharing is not a supported application.

To configure a local interconnect link, use the following path:

COMMAND FACILITY MAIN MENU

3 CONFIGURE LOCAL NODES

CONFIGURE LOCAL NODES

1 PORT CONFIGURATION

ENTER NODE-ID/CHANNEL # (^X TO ABORT): NODE_A/A3

PORT CONFIGURATION

4 LOCAL INTERCONNECT LINK

¹ Requires Communications Control Module, Rev. E or later with Release 3.2 or later software.

Set each end of the link for the same speed (they must match).

SET LINK RATE

1. SYNC EXTERNAL CLOCKS
2. 64000 SYNC INTERNAL CLOCKS
3. 126000 SYNC INTERNAL CLOCKS
4. 192000 SYNC INTERNAL CLOCKS
5. 252000 SYNC INTERNAL CLOCKS

Return to Main Menu.

CONFIGURE LOCAL NODES

ENTRY: M

Reset the unit.

COMMAND FACILITY MAIN MENU

10 RESET

RESET

1 NODE

ENTER "Y" TO CONFIRM OR "N" TO ABORT: Y

PARAMETER RESTORATION

2 CURRENT CONFIGURATION

Set Link Rate Menu

The Set Link Rate menu displays when you select the local interconnect link option and it offers the following options:

- | | |
|---|--|
| <ol style="list-style-type: none"> 1. Sync External Clocks | <p>Supports campus (private wire) applications. An external device (modem, DSU/CSU) will provide the clocking.</p> |
| <ol style="list-style-type: none"> 2. 64000 Sync Internal Clocks 3. 126000 Sync Internal Clocks 4. 192000 Sync Internal Clocks 5. 252000 Sync Internal Clocks | |

Bandwidth on Demand

Bandwidth on Demand is a feature providing additional link bandwidth in a network during times of higher bandwidth usage. This feature allows nodes in a network to activate and deactivate their WAN links based on a configured time schedule. This additional bandwidth can be provided by an additional link, or more likely, by a secondary link.

The Time of Day function sets the time schedule for the Bandwidth on Demand feature to occur. It ensures that the additional bandwidth will only be available during certain time periods. Parameters defining the activation and deactivation thresholds are configurable. Once an event (activation or deactivation) has occurred, then the minimum time interval before the next event can begin is ten minutes.

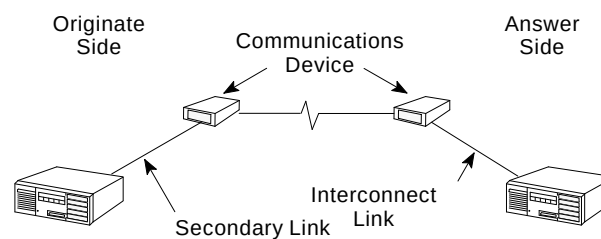
Secondary Interconnect Link

The number of secondary interconnect links available per NetRunner model is as follows:

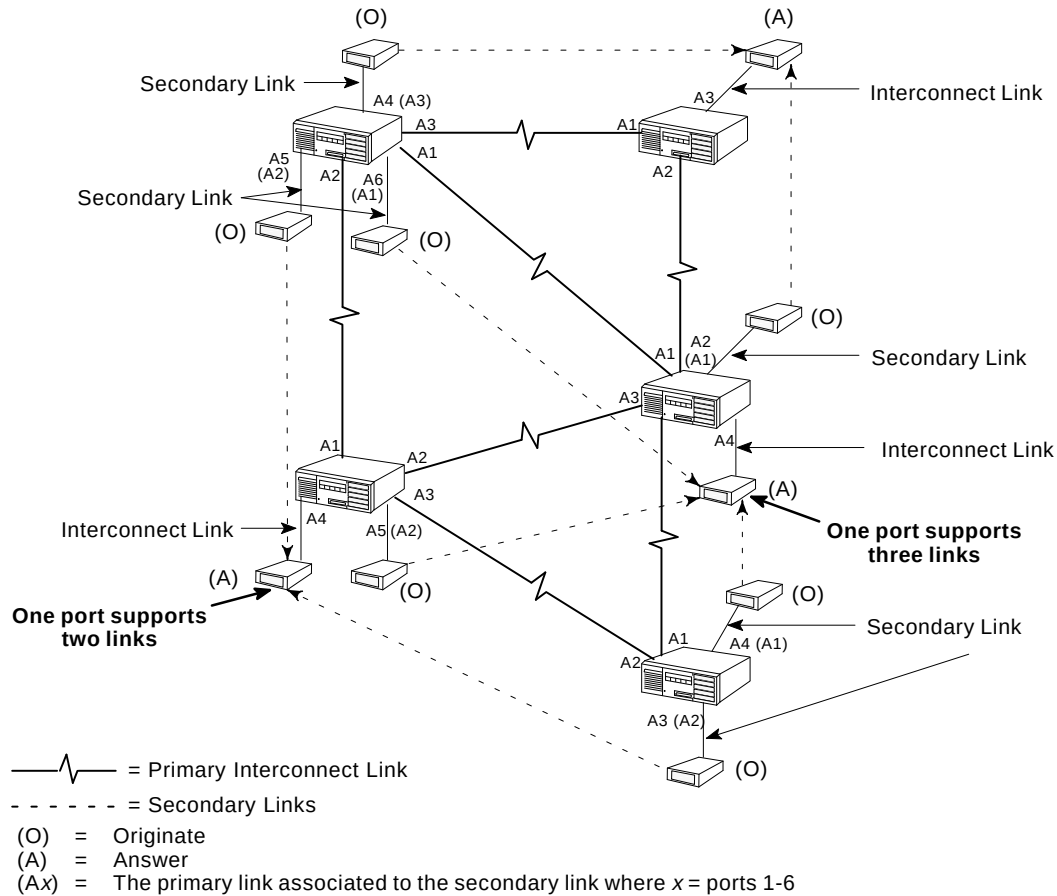
Model	Secondary Links	On Ports
2000ED 2000E 1000E	Up to 6	A1-A6, B1-B6 on 5000E/6DMA module
500ET	Up to 2	A1-A4
75E	Up to 1	A2

The secondary link operates in conjunction with a primary interconnect link to provide link redundancy in the event of link failure or over utilization (assuming power and telephone communications are maintained). An interconnect link is considered a *primary* interconnect link if it has an associated secondary link.

A port is configured as a secondary interconnect link only at the side of the link that will initiate the call (originate). At the answer side of the link (the one receiving the call), configure the port as an interconnect link.



Note: One side of the link must be originate and the other answer. Therefore, a secondary link on one side will always connect to an interconnect link on the other side.



Complex Network

The secondary link may be attached to any of the following devices:

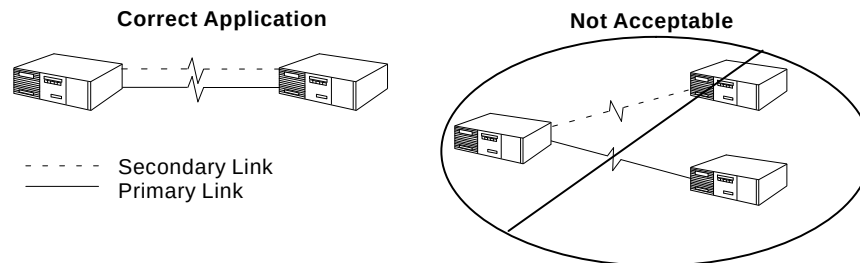
- ISDN Terminal Adapter (TA)
- Modem
- Switched 56 Kbps DSU/CSU

Note: Use equipment which can place a call upon assertion of DTR. The unit will not dial a phone number or pass numbers across to the attached device.

It is important to note the following:

- Originate side is configured as a secondary link and has a single associated primary link.
- Answer side is configured as an interconnect link and may answer for any number of links.
- Before configuring a secondary link, the port designated as the *primary* link must be configured as an interconnect link. A primary link cannot also be assigned as a secondary link.

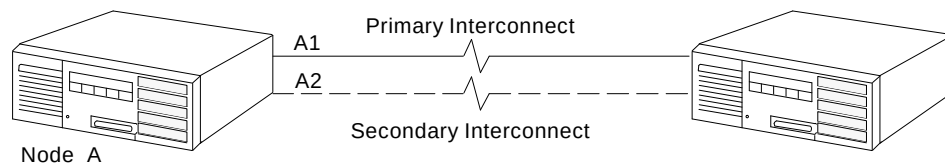
- The remote end of a secondary link must be the same as the primary link.



- Once the secondary interconnect link is attached (associated) to the primary link, the primary interconnect link's configuration cannot be modified. If you wish to change the configuration of the primary interconnect link, the association between primary and secondary link must be eliminated (refer to Deleting a Secondary Link, page 4-13).
- Each secondary link uses processor power (when activated); this should be considered when planning your network if you will be force connecting a secondary interconnect link.
- A secondary interconnect link **cannot serve as a backup link to a local interconnect link**. If you attempt this connection, the unit will display NOT SUPPORTED.
- Configure the secondary link before connecting it to a device. Changing configuration with devices attached could trigger link activation.

Configuring a Secondary Interconnect Link

Using the following example where A1 is to be configured as the *primary* interconnect link and A2 is to be configured as A1's secondary interconnect link, the following steps describe the procedure of configuring a secondary interconnect.



1. Configure the primary link (in this case A1 of Node_A) as an interconnect link. Refer to page 4-6 for this procedure.
2. Configure the secondary interconnect link (in this case A2 of Node_A) using the following path:

Configure A2 as a Secondary Link.

COMMAND FACILITY MAIN MENU

CONFIGURE LOCAL NODES

CONFIGURE LOCAL NODES

PORT CONFIGURATION

ENTER NODE-ID/CHANNEL # (^X TO ABORT): NODE_A/A2

Option number varies depending on model.

PORT CONFIGURATION

SECONDARY INTERCONNECT LINK

Assign A1 as the Primary Link.

ENTER PRIMARY LINK# NO=DEASSIGN, ^X TO ABORT: A1

Return to Main Menu

CONFIGURE LOCAL NODES

ENTRY: M

Reset Node

COMMAND FACILITY MAIN MENU

RESET

RESET

NODE

ENTER "Y" TO CONFIRM OR "N" TO ABORT: Y

PARAMETER RESTORATION

CURRENT CONFIGURATION

Deassigning a Secondary Link

At the prompt where you assign the secondary link to the primary in the Port Configuration menu, enter the word NO at the prompt. This deassigns the link from the primary.

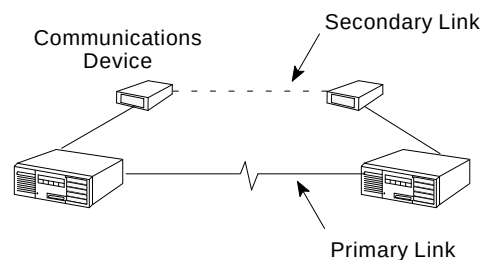
ENTER PRIMARY LINK# "NO"=DEASSIGN, ^X TO ABORT: NO

Note: Deassigning the primary link does not delete the secondary interconnect link, you must reconfigure the port to a new type and reset the unit.

Modes of Operation

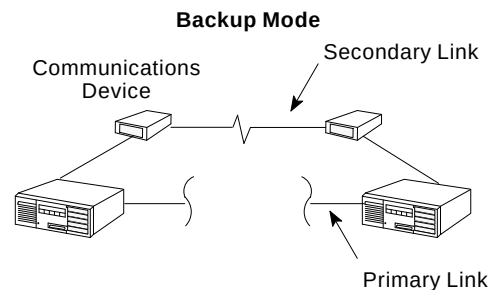
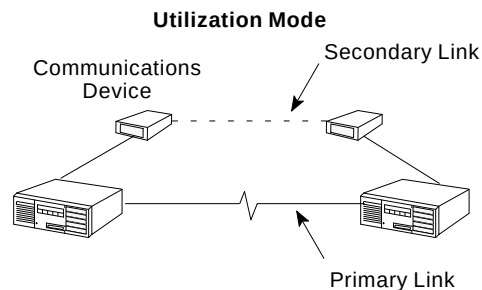
These are the modes of operation for the secondary link:

- *Backup Mode* – In the event of link failure, the secondary link will activate until the primary link returns to service.



- *Utilization Threshold Mode* – In the event the primary link exceeds a threshold (percentage of utilization) for a period of time (in either direction), the secondary link will activate and operate until the thresholds established for dropping the secondary link are met (at both ends of the link) for the designated period of time.

In this mode, the secondary link will also activate on primary link failure.



Time of Day

All secondary links operate by default for 24 hours a day. If a Time of Day schedule is established for the secondary link, it will only operate during the period of time scheduled as *on* time. If the link is scheduled to be *off*, the link will not operate (unless forced on). For information on Time of Day, refer to page 4-17; for information on Forced On operation, refer to page 4-22.

Backup Mode

The criteria for primary link failure is the following:

CD Loss	2-3 seconds
Sync Loss	10 seconds
Failure to Establish Primary	3 minutes
Poor quality of link:	
all data rates above 19.2 Kbps	1 bad bit to 10,000 good bits
19.2 Kbps and below	1 bad bit to 1,000 good bits

If the primary link is down because it is scheduled to be off, the secondary link will not activate. In the event of CD loss or sync loss on the secondary interconnect link, the unit will display SECONDARY LINK FAILURE.

The primary link will attempt a connection every 10 minutes (00:00, 00:10, 00:20 . . . etc.) by raising DTR. The primary link's integrity will be continuously monitored and will be validated for five consecutive minutes before activating. Note that the indicator for the primary link will be *on* solid during validation (on the side configured as originate). Any sync loss or CD loss will cause the testing timer to reset. When the primary link completes the validation process, it will be restored to service and the secondary link will be placed in back up status.

Should the secondary link fail to activate, it will continue to attempt the connection approximately every three minutes, until the primary link activates.

Enabling the backup mode

1. Configure the port for a secondary interconnect link (refer to page 4-9).
2. Follow this path:

Enter the channel number of the primary link (not the secondary link)

The screenshot shows a series of configuration screens in a NetRunner interface. The first screen is titled 'CONFIGURE LOCAL NODES' and has a button labeled 'LINK ACTIVATION PARAMETERS'. The second screen is titled 'ENTER LINK CHANNEL # (^X TO ABORT):'. The third screen is titled 'PRIMARY LINK ACTIVATION PARAMETERS' and has a button labeled '2 UTILIZATION THRESHOLDS'. The fourth screen is titled 'UTILIZATION THRESHOLDS' and has a button labeled '5 BACKUP ONLY'. The fifth screen is titled 'BACKUP ONLY' and has a button labeled '1 ON'.

To disable the backup link mode, follow the same path and select the *off* option.

Utilization Threshold Mode

This mode offers extra bandwidth for those times that primary link traffic is heavy, plus the backup mode feature. It functions in the following way:

- Primary link utilization is monitored (at the *originating unit* in both directions).
- Primary interconnect link exceeds the percentage of utilization for a defined period of time in either direction. Example: Port A1 (primary) exceeds 75% utilization for five minutes.
- Secondary interconnect link activates¹.
- Secondary interconnect link and primary link are monitored (on both sides of both links, originate and answer).
- Both links' utilization fall below a percentage of utilization for a defined period of time. Example: Port A1 (primary) and Port A2 (secondary) combined fall below 50% of primary link utilization for five minutes.
- Secondary interconnect link de-activates (drops).
- Primary link utilization is monitored.

¹ If the link cannot activate, it continues attempting a connection approximately every three minutes until the criteria for *Secondary Off Threshold* and *Off Threshold Time Length* is met.

Enabling the utilization threshold mode on the secondary interconnect link

1. Configure the port for a secondary interconnect link (refer to page 4-9).
2. Follow this path:

Enter the channel number of the primary link (not the secondary link)

CONFIGURE LOCAL NODES

☐ LINK ACTIVATION PARAMETERS

ENTER LINK CHANNEL # (^X TO ABORT):

PRIMARY LINK ACTIVATION PARAMETERS

☒ 2 UTILIZATION THRESHOLDS

UTILIZATION THRESHOLDS

1. SECONDARY ON THRESHOLD (%)	[75]
2. ON THRESHOLD TIME LENGTH (min)	[5]
3. SECONDARY OFF THRESHOLD (%)	[50]
4. OFF THRESHOLD TIME LENGTH (min)	[5]
5. SECONDARY LINK BACKUP ONLY	[OFF]

Option

Description

(Numeric values can be set for 1-99)

- | | |
|------------------------------------|---|
| 1. Secondary On Threshold (%) | Sets the utilization (in percentages) that the primary link must exceed before the secondary link will activate. The default is 75%. |
| 2. On Threshold Time Length (min) | Sets the period of time (in minutes) that the primary link must operate above the threshold set in option 1 before the secondary link will activate. The default is 5 minutes. |
| 3. Secondary Off Threshold (%) | Sets the utilization (in percentages) that the primary and secondary together (in both directions) must <i>not</i> exceed before the secondary link will de-activate (drop). The default is 50%. |
| 4. Off Threshold Time Length (min) | Sets the period of time (in minutes) that the primary and secondary link must remain below the threshold set in option 3 before the secondary link will de-activate (drop). The default is 5 minutes. |
| 5. Secondary Link Backup Only | For the Utilization Mode, this menu should be set to <i>off</i> . |

Time of Day

This feature establishes or disables link operation during a certain time of the day. By default, all links are set to be operational 24 hours a day, seven days a week. If you set up a schedule for a link, it will function in the following way:

- *Primary Link* – Turns the link *on* and *off* at the designated times.
- *Secondary Link* – Permits the link to be enabled for its type of operation (backup or primary link utilization) during the scheduled *on* times. Should the primary link fail during the *off* times, the secondary interconnect link will *not* come up. On the secondary link, the time of day schedule should be set only on the originate side.

Important

If you require the backup or utilization feature to be operational at all times, do not set a schedule for the secondary link. (If a schedule was set, refer to Cancelling the Time of Day Schedule on page 4-19.)

Note: To temporarily override the Time of Day feature on a link scheduled to off, set the link to Forced On. (Refer to page 4-22, for additional information.)

Setting up the Time of Day Schedule

You may set up the schedule for an Interconnect Link or a Secondary Interconnect Link. It is assumed that you have already set the time, day, and date on your unit. It is recommended that your network include a Real Time Clock; it is not required.

This section explains the time of day schedule. It is one element of bandwidth on demand. For specific information on activating a link, refer to the Interconnect Link and Secondary Interconnect Link sections which follow.

Important

The daily schedule is set at one time. If you wish to add to it or edit it, you must set up a whole new schedule. Each time you access the menu, it establishes a new schedule for the day selected.

Time Syntax

- **Times are entered using a 24-hour clock.** That means that 1:00 p.m. is entered as 13:00 and 5:00 p.m. is entered as 17:00. Times are referenced to the master clock established for the network.
- **Times are entered in 10-minute intervals.** These are always 0, 10, 20, 30, 40, and 50 minutes of the hour. For example 1 o'clock a.m. would have the following 10-minute intervals: 1:00, 1:10, 1:20, 1:30, 1:40, 1:50.

Option number varies, depending on model.

CONFIGURE LOCAL NODE

☐

LINK ACTIVATION PARAMETERS

Enter either the primary or secondary link port, depending on which you wish to configure.

ENTER LINK CHANNEL # (^X TO ABORT):

SECONDARY LINK or PRIMARY LINK ACTIVATION PARAMETERS

TIME OF DAY

Select the option for your schedule.

TIME OF DAY ACTIVATION

1. SUNDAY
2. WEEKDAYS
3. SATURDAY

Once you start scheduling, you must complete the schedule for the whole day.

ACTIVATION SCHEDULE

SET

Enter the start time (in 24 hour time).

ENTER START TIME (hh:mm, X TO ABORT, 24:00 TO END):

Enter the stop time (in 24 hour time).

ENTER STOP TIME (hh:mm, X TO ABORT, 24:00 TO END):

Continue to enter start and stop times until the schedule for the day is complete. Once this is done, enter 24:00 to complete the process:

- If you enter 24:00 at the Start Time prompt, the link will be *off* for the remaining part of the day.
- If you enter 24:00 at the Stop Time prompt, the link will be *on* for the remaining part of the day.

Example:

For the weekdays, the link is configured to turn on at 7:30 a.m. and turn off at 10:00 a.m., and then turn on again at 8:00 p.m. and remain on until 9:00 p.m., when it will turn off for the remainder of the day.

ENTER START TIME (hh:mm, X TO ABORT, 24:00 TO END): 07:30

ENTER STOP TIME (hh:mm, X TO ABORT, 24:00 TO END): 10:00

ENTER START TIME (hh:mm, X TO ABORT, 24:00 TO END): 20:00

ENTER STOP TIME (hh:mm, X TO ABORT, 24:00 TO END): 21:00

ENTER START TIME (hh:mm, X TO ABORT, 24:00 TO END): 24:00

Cancelling the Time of Day Schedule

Follow the same path as you would for establishing a schedule. At the first prompt (ENTER START TIME) enter 00:00, at the next prompt (ENTER STOP TIME) enter 24:00. The link will remain on all the time thus disabling any previous schedule.

- Notes:**
- Be sure to do this for all the schedules (weekdays, Saturday and Sunday).
 - Entering 24:00 at the START TIME causes the link to be off all the time.

Displaying a Schedule

To display a configured schedule, follow the same pathway as for configuration, select the *Display* option from the Activation Schedule.

ACTIVATION SCHEDULE

2 DISPLAY

LINK ON	LINK OFF
07:30	10:00
20:00	21:00

For lengthy configured schedules, you will need to pause the screen display. To pause the screen display, press ^S¹. To continue the display, press ^Q.

¹ ^S = <control> S which means hold the control key down while pressing S on the keyboard.

Interconnect Link and Time of Day Operation

It is assumed that you intend to turn your interconnect link on and off during a 24-hour period of time.

Activating Time of Day Operation on an Interconnect Link

Step		Reference
1	Configure the port for an interconnect link.	Port Configuration, page 4-1.
2	Set the <i>Force On</i> option of the Control Parameters menu to <i>no</i> . This must be done so that the link shuts off at the scheduled <i>off</i> periods of time. By default, it is set to Force On = yes.	Force On, page 4-22.
3	If the link is going to operate with an associated secondary interconnect link, configure the secondary interconnect link and its operation.	Secondary Interconnect Link, page 4-9.
4	Configure a Time of Day schedule.	Time of Day, page 4-17.

Disabling the Time of Day Operation on an Interconnect Link

Either of these methods will disable the operation:

- Set the *Force On* option of the Control Parameters menu to *yes*. The link will remain on and override the Time of Day schedule. Force On, page 4-22.
- Configure a new Time of Day schedule for that link, by entering 00:00:00 at the *first* Start Time prompt and 24:00 at the *first* Stop Time prompt. Time of Day, page 4-17.

Secondary Link and Time of Day Operation

Enabling the Time of Day Operation on a Secondary Interconnect Link

Step		Reference
1	Configure the port for a secondary interconnect link (assign it to a primary link), and configure the type of operation required (either backup mode or utilization mode).	Secondary Interconnect Link, page 4-9.
2	Ensure that the <i>Force On</i> option of the Control Parameters menu is set to <i>no</i> (the default for secondary interconnect links).	Force On, how to disable feature, page 4-22.
3	Configure the remote port that will be connecting to the secondary link as an interconnect link. Ensure that the <i>Force On</i> option of the Control Parameters menu is set to <i>yes</i> (the default for interconnect links).	Force On, page 4-22.
4	Configure a Time of Day schedule for the secondary link.	Time of Day, page 4-17.
5	Connect the link to the external communications devices. You can force on the link to test link operation on the secondary link side. If you do so, be sure to disable the force on feature (Force on = no) on the secondary link side after the testing is complete.	

Disabling the Time of Day Operation on a Secondary Interconnect Link

Procedure	Reference
Configure a new Time of Day schedule for that link, by entering 00:00 at the first Start Time prompt and 24:00 at the first Stop Time prompt. The secondary link will now operate 24 hours a day. The Time of Day feature will be disabled.	Time of Day, page 4-17.

Force On – Link Activation

The following links can be forced on:

- All links configured as interconnect links (primary links)
- Secondary interconnect links on NetRunner 500ET (A1-A3 only), NetRunner 1000E and NetRunner 2000E,ED.

This feature will override the backup, utilization and time of day configuration. A link placed in a forced-on state will remain in this state until it is turned *off* (refer to *Disabling forced-on operation*).

- *Interconnect links* – Unless configured to turn on and off via the Time of Day schedule, interconnect links should be forced on (*yes*). This is also true for interconnect links that are serving as the answer side for secondary links.
- *Secondary links* – The forced on option (*yes*) of the secondary interconnect link is designed for testing purposes. The normal operation is Forced On = *no*. Secondary links on the NetRunner 75E cannot be forced on.

Forcing on a Link

	CONFIGURE LOCAL NODES ☐ LINK ACTIVATION PARAMETERS
Enter the channel number of the link to be forced on.	ENTER LINK CHANNEL # (^X TO ABORT):
Option number varies depending on model.	PRIMARY OR SECONDARY LINK ACTIVATION PARAMETERS ☐ CONTROL PARAMETERS
	CONTROL PARAMETERS 2 FORCED ON
	FORCED ON 1 YES

Disabling Forced-on Operation

Select the *no* option from the Forced On menu.

FORCED ON

2

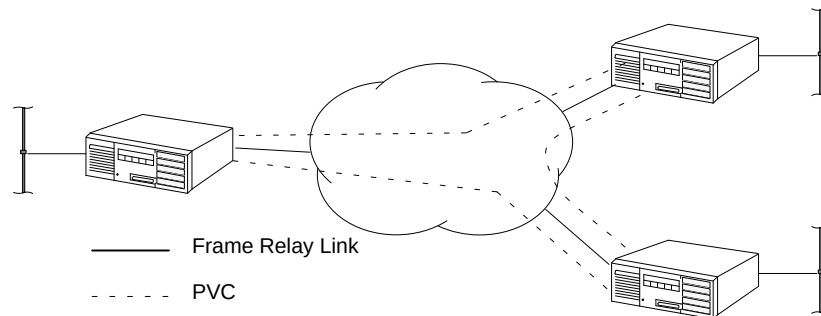
NO

The *no* option does not disable link operation. It places the link in a *not forced-on* state.

Primary Link – The link will turn off upon reaching its next scheduled off time.

Secondary Link – In Backup Mode: Link will deactivate immediately. In Utilization Mode: Link will deactivate when the criteria for *Secondary Off Threshold* and *Off Threshold Time Length* are met.

Frame Relay Link



Public frame relay service offers you the benefits of leased line connectivity to multiple sites. One physical connection into the public frame relay network logically provides the connectivity of a mesh network, although physically the network is a star topology. Applications predominantly use frame relay services for local area networking (LAN) and/or Systems Network Architecture (SNA) internetworking. Other than multiplexing permanent virtual circuits (PVCs) over a single physical link, the network operates just like any Integration network.

- Available on NetRunner 75E¹, 500ET, 1000E, and 2000E,ED.
- You can use frame relay, interconnect or local interconnect links simultaneously, building hybrid networks².
- If your network has closed loops (such as the example shown above), be sure to enable mesh (*mesh on*) on the units within the network.
- Zero Committed Information Rate (CIR) is a supported feature.

¹ Requires a 75E unit with serial number of 518S0829 or higher. For units with a serial number lower than 518S0829, contact your MICOM Certified Distributor.

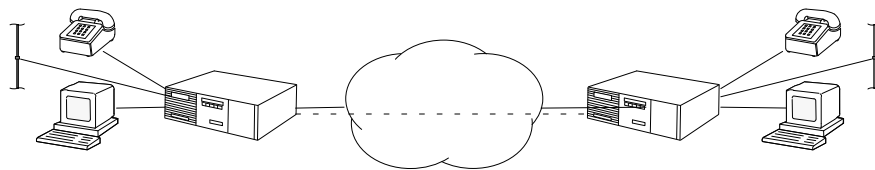
² If using hybrid networks or multiple frame relay links, frame relay should not exceed 512 Kbps.

Frame Relay Links and DLCIs

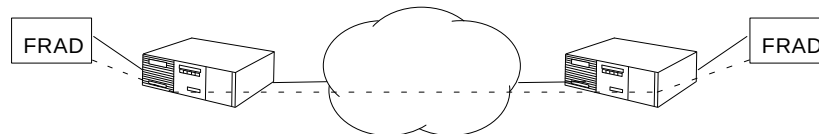
Unit	Max # of Frame Relay Access Links	Ports which can be Frame Relay Access Links	Max # of Configured PVCs/DLCIs Per Node
NetRunner 75E	2	A1, A2	32
NetRunner 500ET	4	A1-A4	64
NetRunner 1000E	6	A1-A6	96
NetRunner 2000E,ED	6	A1-A6	128

There are generally two modes of operation for frame relay:

- **Virtual Link:** Permanent virtual circuits (PVCs) between Integration units which carry traffic terminated or switched at each node. The DLCI's Level 2 Protocol must be configured for *virtual*.



- **Pass-Through PVCs (permanent virtual circuits):** A connection involving two or more DLCIs which supports frame relay access devices (FRADs). The DLCI's Level 2 Protocol must be configured for either *Transparent* or *Fragmented*. Refer to Pass-Through Applications on page 4-33 for additional information.



Activated Link Maximums

An *activated link* is a PVC that has been configured on the unit.

Unit	Virtual Links (up to a maximum of)	Pass-Through PVCs ¹ (up to a maximum of)
NetRunner 75E	12	10
NetRunner 500ET	20	22
NetRunner 1000E	24	36
NetRunner 2000E,ED	36	46

¹ In this application, there are two DLCIs for each PVC. These may be increased if the number of virtual links is decreased.

Note: The maximums given are for a frame relay only application. In a hybrid network (frame relay and interconnect links) the numbers may vary. Contact your MI-COM Certified Distributor for additional information.

Utilized Link Maximums

A *utilized link* is defined as a link actually transmitting and receiving data between nodes at a given instant in time.

Unit	Virtual Links (up to a maximum of)	Pass-Through PVCs (up to a maximum of)	Total per Node ¹
NetRunner 75E	8	8	12
NetRunner 500ET	12	12	20
NetRunner 1000E	16 ²	12	24
NetRunner 2000E,ED	20 ²	20	32

¹ Application dependent.

² Without mesh enabled; with mesh enabled, the maximum is 12.

Maximum Link Speeds (on a Frame Relay only unit)

Unit	The maximum bandwidth combination (in Kbps) for the following ports:					
	A1	A2	A3	A4	A5	A6
NetRunner 75E	384	256	n/a	na/	n/a	n/a
NetRunner 500ET	512	512	–	–	n/a	n/a
	256	256	256	256	n/a	n/a
NetRunner 1000E	512	512	–	–	–	–
NetRunner 2000E,ED	512	256	256	–	–	–
	256	256	256	256	–	–
	256	256	128	128	128	128

Recommendations

- Sync support: The number of sync channels supported over the frame relay access link depends on the link's rate and the CIR (Committed Information Rate) implementation of the frame relay switching equipment and network congestion characteristics.
 - It is recommended that you use the SNAPS option for SNA traffic to reduce delay and network traffic.
 - It is recommended that sync speeds be 19.2 Kbps or higher. If you are using a slower speed, the block size should be short.
 - TDM sync channels are not supported.
- Voice/Fax support: The number of voice/fax channels supported over the frame relay access link depends on the link's rate and the CIR implementation of the frame relay switching equipment and network congestion characteristics. (Generally this is 80% of the CIR.)
 - Voice channels configured for continuous bandwidth are not supported.

- It is recommended that you do not connect two frame relay networks over a leased line backbone.
- If using frame relay links in a mesh environment (closed loop), be sure to enable mesh (Mesh Router = *On* in the Node ID Configuration Menu).
- With mesh enabled, the maximum number of utilized *virtual* links is 12. In hybrid networks, reduce the number of utilized virtual links by one for each configured interconnect link.

Configuration Prerequisites

Prior to configuration, obtain the following information from the carrier provider:

- DLCI numbers (there will be two DLCI numbers for each DLC, one for each end point)
- DLCI parameters (Be, and CIR)
- Local management protocol: Annex D, LMI Rev. 1 or None
- Local management parameters (if Annex D or LMI Rev. 1 Protocol).

Prior to connecting to the frame relay network, you must configure the DLCI (add DLCI) and verify that port clocking (if other than external) is correctly set. This configuration can only be accomplished at the local unit (it can not be done remotely). Once this is complete, the frame relay link can be attached and the DLCI connected. The process is as follows:

1. Configure port for frame relay (refer to Port Configuration, page 4-1) and reset the node to *current configuration*.
2. Configure the frame relay link parameters (see Frame Relay Link Parameters, page 4-28).
3. Reset the frame relay link (reset access link option) to set the frame relay link parameter configuration changes (refer to page 4-30).
4. Configure the DLCI (refer to DLCI Configuration, page 4-31).
5. Reset the DLCI to set the DLCI parameter changes (page 4-31).
6. Connect the frame relay link.

Frame Relay Parameters

Follow this menu path to configure the parameters:

Note: Before proceeding, the port must have previously been configured as frame relay (Port Configuration Menu) and the node reset to current configuration.

Option number varies depending on model

CONFIGURE LOCAL NODES

☐ FRAME RELAY PARAMETERS

ENTER NODE ID/CHANNEL # (^X TO ABORT): NODE_A/A1

FRAME RELAY PARAMETERS

1. FRAME RELAY LINK PARAMETERS

2. LOCAL MANAGEMENT PROTOCOL PARAMETERS

3. DLCI CONFIGURATION

Option	Description
1. Frame Relay Link Parameters	Sets the clocking, speed, frame size, address, and local management protocol for the access link. Refer to Frame Relay Link Parameters for additional information.
2. Local Management Protocol Parameters	Configures the local management protocol parameters.
3. DLCI Configuration	Adds, deletes, lists and modifies the parameters of a DLCI. Refer to DLCI Configuration, page 4-31.

Frame Relay Link Parameters

FRAME RELAY PARAMETERS

1 FRAME RELAY LINK PARAMETERS

ENTER NODE ID/CHANNEL # (^X TO ABORT): NODE_A/A1

FRAME RELAY LINK PARAMETERS

1. CLOCK SPEED
2. PORT CLOCKING
3. MAXIMUM FRAME SIZE
4. NETWORK ADDRESS
5. LOCAL MANAGEMENT PROTOCOL

Option	Description
1. Clock Speed	Sets the clock rate. If externally clocked (Port Clocking option), no configuration is required. Default = 64000.
2. Port Clocking	Sets the link's source for a receive and transmit clock. If you configure internal clocking, set the rate desired (Clock Speed option). Default = external clocking.
3. Maximum Frame Size	Sets the maximum frame size (in octets) including header and user information. It does not include the frame check sequence. Default = 4096. Range = 5-8189.
4. Network Address	Address of the frame relay channel (assigned by the carrier provider based on a standardized numbering scheme). Up to 16 characters.
5. Local Management Protocol	Sets the protocol required by the carrier provider. If you select <i>Annex D</i> or <i>LMI Rev. 1</i> protocols, be sure to configure those parameters.

Local Management Protocol Parameters

If you select either Annex D or LMI Rev. 1 local management protocol, you may set the management parameters using the following path:

FRAME RELAY PARAMETERS

2

LOCAL MANAGEMENT PROTOCOL PARAMETERS

LOCAL MANAGEMENT PROTOCOL PARAMETERS

1. FULL STATUS POLLING COUNTER
2. ERROR THRESHOLD
3. MONITORED EVENTS COUNT
4. LINK INTEGRITY VERIFICATION TIMER
5. POLLING VERIFICATION TIMER
6. ACCESS LINK MODE

Option	Default	Description
1. Full Status Polling Counter	6	The frequency that full status reports are made relative to the status inquiry polls (1-255).
2. Error Threshold	3	The number of errors that need to occur in the last monitored events (next option) before the link is considered down (1-10).
3. Monitored Events Count	4	The number of consecutive events that are monitored to determine the link status (1-10).
4. Link Integrity Verification Timer	10	The number of seconds after which the unit will send a status inquiry to the frame relay network (5-30 seconds).
5. Polling Verification Timer	15	If the network does not receive a valid status inquiry within the time configured (in seconds), it reports an error (5-30 seconds).
6. Access Link Mode	User	Selects whether the user or the network will generate statistics for the access link. (Network = Links connected to frame relay access devices (FRADs); User = other applications)

Frame Relay Link Reset

After changing access link parameters, you must reset the access link. After changing DLCI parameters, you must reset the DLCI. Follow this path to the reset options.

COMMAND FACILITY MAIN MENU

☐ RESET

RESET

☒ 2 LINK

ENTER LINK CHANNEL # (^X TO ABORT): A1

FRAME RELAY LINK RESET

1. RESET ACCESS LINK

2. RESET SPECIFIC DLCI

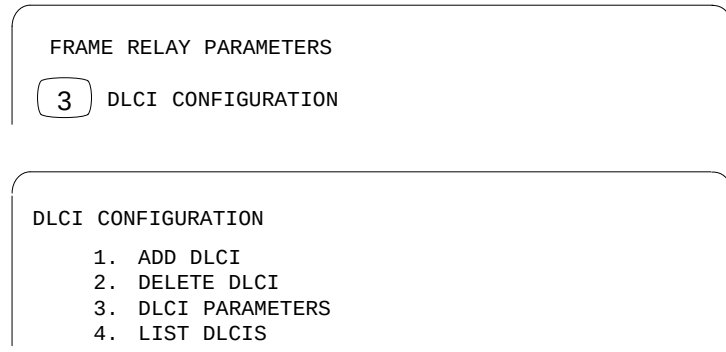
3. RESET ALL DLCI'S

If the port is configured as a frame relay link, the Frame Relay Link Reset menu will display.

Option	Description
1. Reset Access Link	Sets the Frame Relay Link Parameters. Reset required to establish newly configured parameters.
2. Reset Specific DLCI	Resets the unit-to-unit protocol that uses the DLCI for communications. Enter the four-digit DLCI at the ENTER DLCI TO RESET prompt.
3. Reset All DLCI's	Resets all the known DLCIs on the frame relay link.

DLCI Configuration

Accessed from the Frame Relay Parameters menu, this menu offers the following options:



Option	Description
1. Add DLCI	Specifies a DLCI for the frame relay link and sets the Level 2 Protocol.
2. Delete DLCI	Deletes a DLCI from a frame relay link.
3. DLCI Parameters	Sets the parameters for a specific DLCI. The information for these menu options comes from the carrier provider.
4. List DLCIs	Lists the known DLCIs on the link. The status of each DLCI is given. (Refer to page 4-35.)

Level 2 Protocol

This menu displays when you add a DLCI to your unit:



Option	Description
1. Transparent	For links connecting directly to frame relay access devices (FRADs). (Refer to Pass-Through Applications on page 4-33.)
2. Virtual Link	For links connecting to other Integration units. This is for units without frame relay access devices attached.

Option	Description
3. Fragmentation	For links connecting to other Integration units. This is for a DLCI which will be connected to another DLCI (within the unit) with frame relay access devices (FRADs) attached. This option reduces the frame size across the link, thus reducing delays and maintaining voice quality. (Refer to Pass-Through Applications on page 4-33.) Note: With fragmentation, you cannot configure the frame size. The unit will fragment automatically.

Note: To change a configured Level 2 Protocol, delete the DLCI, add the DLCI, and then set the new protocol.

DLCI Parameters

Once you have configured a DLCI you will need to configure the DLCI parameters:

FRAME RELAY PARAMETERS

3

DLCI PARAMETERS

DLCI PARAMETERS

1. COMMITTED BURST SIZE FORWARD (BC.FWD)

2. COMMITTED BURST SIZE BACKWARD (BC.BWD)

3. EXCESS BURST SIZE FORWARD (BE.FWD)

4. EXCESS BURST SIZE BACKWARD (BE.BWD)

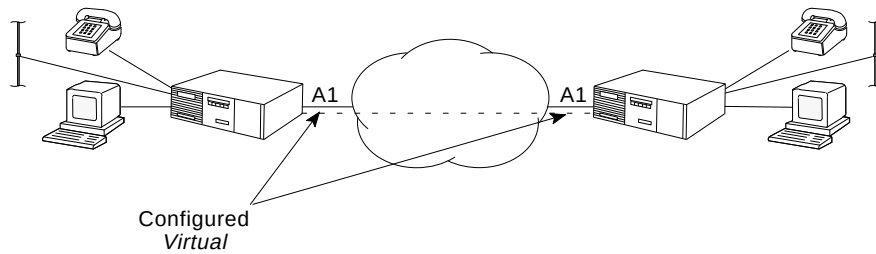
5. CIR FORWARD (CIR.FWD) (BPS)

6. BACKWARD (CIR.BWD) (BPS)

- **Committed burst size: (Bc)** The maximum amount of data, in bits, that a network agrees to transfer under normal conditions. Data may or may not be contiguous.
- **Excess burst size: (Be)** The maximum amount of uncommitted data, in bits, that the network will attempt to deliver. Data may or may not be contiguous.
- **CIR, Committed Information Rate:** Similar to data rate, the predictable level of service for the DLCI. If you are using voice in your network, do not select a rate lower than 16 Kbps unless you are using zero CIR.

Virtual Links

Virtual links are permanent virtual connections (PVCs) between Integration units which carry traffic terminated or switched at each node.

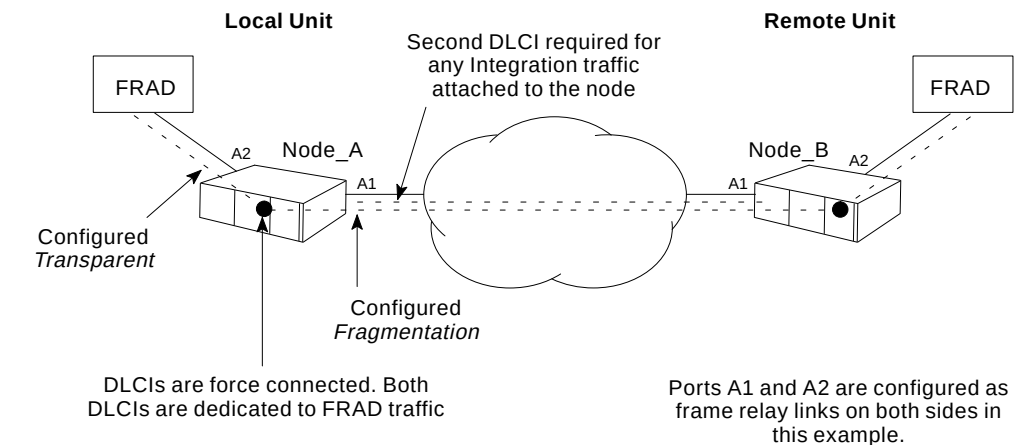


Note: No FRADs attached

Pass-Through Applications: Attaching Frame Relay Access Devices (FRADs)

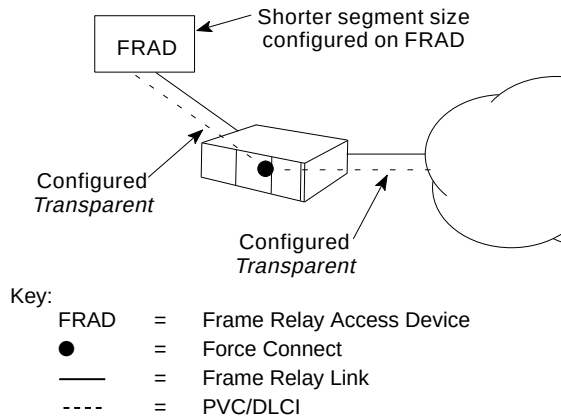
Configure the unit as shown in the diagram for the optimum performance.

Connecting FRADs through Integration units

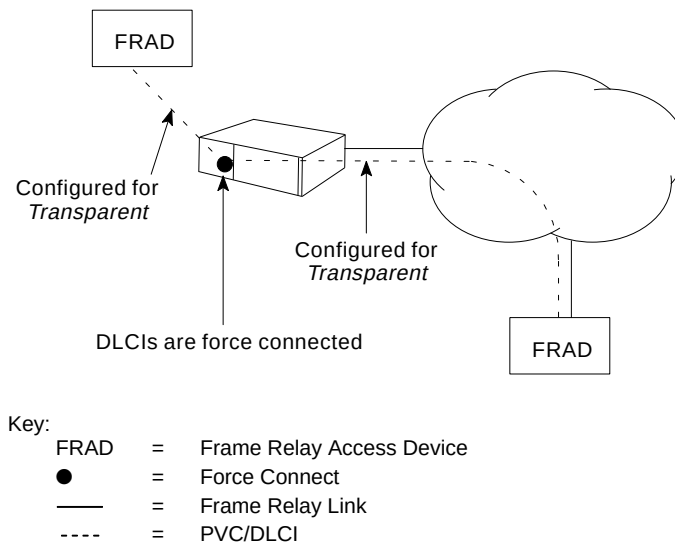


- The DLCI with a FRAD should be force connected to the network side DLCI (in the example this is Node_A/A2.xxxx to Node_A/A1.xxxx, where xxxx = DLCI). Refer to page 5-22 for information on force connection. Once force connected, all the DLCIs in the path are considered a single permanent virtual circuit (PVC).

- Rather than using a DLCI configured for *fragmentation* on the network side of a pass-through application, you may select a *transparent* configuration. In this case, the attached device (FRAD) needs to be configured to a shorter segment size thus reducing voice delays across the network. A good general rule is to use one octet per kilobit of channel speed. So for 256 Kbps channel rate, a segment size of 256 octets is suggested. The maximum channel frame size is 2048 octets.



Connecting a FRAD through an Integration unit to another FRAD directly connected to the frame relay network



Resetting the DLCI

To set the newly configured parameters, you must reset the DLCI as shown.

COMMAND FACILITY MAIN MENU

10

RESET

RESET

2

LINK

ENTER LINK CHANNEL # (^X TO ABORT): A1

FRAME RELAY LINK RESET

2

RESET A SPECIFIC DLCI

ENTER DLCI TO RESET (^X TO ABORT):

The Frame Relay Link Reset menu will display only if the port is configured as a frame relay link.

List DLCI

For the frame relay link, you may wish to view a list of the DLCIs and their state (configured, reported, and active). Follow this path:

CONFIGURE LOCAL NODES

FRAME RELAY LINK PARAMETERS

ENTER NODE-ID/CHANNEL # (^X TO ABORT):

FRAME RELAY PARAMETERS

3

DLCI CONFIGURATION

DLCI CONFIGURATION

4

LIST DLCI

101-VRA 103-V 114-R 115-VR 222-FRA 223-FRA
325-UR 727-TRA

8 DLCI'S ON FRAME RELAY LINK A01

V = DLCI configured as virtual link
 F = DLCI configured for fragmentation
 T = DLCI configured for transparent protocol
 R = DLCI reported
 A = DLCI active
 U = DLCI unassigned

Remote Configuration

Remote configuration is altering or setting any parameter on any unit other than the local NetRunner unit. Once the WAN network link is operational, this process can occur.

Remote NetRunner Configuration

The local NetRunner unit can configure the remote NetRunner unit in the same manner as the local NetRunner is configured. You should connect one WAN network link first, then reconfigure the remote node name and ID before connecting the next WAN network link (if the link is connected to yet another remote NetRunner unit).

Note: Refer to the Installation and Cabling Manual for connection and cabling information.

If you see the message !240 DUPLICATE NODE ID #[channel number] during the configuration procedure which follows, it means you did not rename the local node. You need to complete that configuration first before renaming the remote node (refer to instructions on page 3-7).

It is not recommended that you configure integral modems remotely.

The diagram illustrates the sequence of commands for remote configuration. It starts with a box labeled 'COMMAND FACILITY MAIN MENU' containing a circled '4' and the text 'CONFIGURE/VIEW REMOTE NODE'. Below this is a box for 'ENTER REMOTE NODE-ID (^X TO ABORT): !240'. The final box is for 'ENTER REMOTE COMMAND FACILITY PASSWORD (^X TO ABORT): <cr>'. Arrows indicate the flow from the menu selection to the node ID entry and then to the password entry.

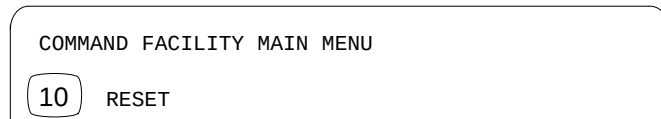
```
graph TD
    A[COMMAND FACILITY MAIN MENU  
4 CONFIGURE/VIEW REMOTE NODE] --> B[ENTER REMOTE NODE-ID (^X TO ABORT): !240]
    B --> C[ENTER REMOTE COMMAND FACILITY PASSWORD (^X TO ABORT): <cr>]
```

The remote Command Facility Main Menu will display. It looks exactly the same except that the node ID of the remote node ID will be displayed at the top of the screen. This is the only difference between the remote and local Command Facility Main Menu.

From this point, the procedure to configure the remote NetRunner is the same as that for the local NetRunner. Remember that this invokes a node reset, which returns you will be returned to the local Command Facility.

Resetting the Unit

If the WAN network link is not working properly, it can be reset. If the other end of the link is a MICOM mux, the mux will also reset. Note that all channels currently using the link will experience a temporary interruption.



There are several kinds of resets in the Command Facility, as follows:

Node - Resets the local node; all channels connected locally and the Command Facility will be disconnected. Required after making any changes to the port configuration. (The remote units are not reset.) A second menu will display the options.

Link - Resets the selected link; all ports currently using the link will be disconnected. Force connected channels automatically reestablish connections.

If the link is configured for frame relay, an additional menu displays (refer to Frame Relay Link Reset on page 4-30).

Channel - Resets a single channel (voice/fax or data only).

Integral LAN - Resets the Integral LAN module to current configuration or default values. If the default values option is selected, only the LAN module parameters are restored to their factory defaults.

When selected, this option displays the following prompt:
ENTER MODULE LOCATION [B-E] (^X TO ABORT):

Enter the module location for the Integral LAN module to be reset followed by a carriage return to accept the entry. To terminate without resetting the LAN module, press ^X.

Node: Bank Selected Software - (Option is displayed only if you have a FlashPak installed or on all 75E units.) If you have proceeded through all the steps to download and select a bank, this option resets the node and installs the selected bank into RAM. This reset and download will take several minutes to complete.

Node Reset

For some resets, two selections are offered:

- **Factory Defaults** – returns the entire system configuration to the factory defaults. This is also known as a cold start.
- **Current Configuration** – sets the unit to the current configuration and updates the network (once the network is connected). This is also known as a warm start.

Perform a node reset to current configuration by following this path of selections through the menus:

For example, select a node reset.

COMMAND FACILITY MAIN MENU

10

 RESET

RESET [node ID]

1

 NODE

ENTER "Y" TO CONFIRM OR "N" TO ABORT: Y

Most often you will select option 2, Current Configuration.

PARAMETER RESTORATION

1.

 FACTORY DEFAULTS

2

 CURRENT CONFIGURATION

Data Channels and Switching Configuration 5

This section contains more information about the NetRunner Command Mode and Command Facility.

Note: The defaults discussed in this section are factory defaults. If your unit has been configured by your distributor or by another user, those parameters may not match the defaults listed here.

Port Configuration Menu

Follow this menu path to configure the async or sync ports:

Enter the node ID, a slash, and channel number.

COMMAND FACILITY MAIN MENU

3

 CONFIGURE LOCAL NODES

CONFIGURE LOCAL NODES

1

 PORT CONFIGURATION

ENTER NODE ID/CHANNEL # (^X TO ABORT): !240/A4

PORT CONFIGURATION [port type]
1. ASYNC
2. SYNC

Important

After configuring the port, reset the unit from the Command Facility Main Menu.

Reset node

COMMAND FACILITY MAIN MENU

10 RESET

RESET

1 NODE

ENTER A "Y" TO CONFIRM OR "N" TO ABORT: Y

PARAMETER RESTORATION

2 CURRENT CONFIGURATION

Sync Channels

The ports that can be configured as sync are A2-A6¹ on the CCM and all ports on the 5000E/6 and 5000E/6DMA² CEM modules. Sync channels are only supported as direct attachments to an Integration unit (not MICOM muxes).



CAUTIONS

- **Sync channels are not switchable and *must* be force connected**, refer to Force Connections page 5-22 for this procedure.
- Unless you have an NMS module installed, you must leave one port configured for async (to access the Command Facility).

¹ For the NetRunner 50E and 75E: either A2 or A3 – only one at a time can be sync. If A2 is configured for sync, A3 cannot be, and vice versa.

² NetRunners 1000E, 2000E and 2000ED.

Sync Channel Protocol Menu

When you configure a port for sync (page 5-1), the following protocol options will display:

Option	Description
1. DLC	For SDLC and HDLC.
2. ASCII Bisync	Use with the following considerations: a 7-bit ASCII code with parity, with either one or two bytes longitudinal redundancy check (LRC) or a block check character (BCC), and a minimum of two pad characters following each transmission having the value of 'FF' (hexadecimal).
3. EBCDIC Bisync	Use with IBM 3270, 2780 and 3780 protocols.
4. H-P Sync	Host-to-host sync data transfer which runs a modified form of ASCII Bisync.
5. RTS/CTS	For half-duplex customized or <i>non-standard</i> control sequences. Data is passed through the system according to MICOM proprietary algorithms. Transmission is independent of the line protocol and may be used with any sync protocol.
6. Sync-Pad	For customized or <i>non-standard</i> control sequences. It can run full or half duplex. You configure the value and number of pad characters for the end of block and the unit interprets it as such.
7. MICOM DLC	For use when the unit is cascading with MICOM muxes. All external multiplexers must have all ports configured for asynchronous channels.
8. MICOM Voice	Select when an external Advanced Packetized Voice digitizer with DLC protocol (APV1/DLC) is to be used. This protocol is a modified DLC protocol with block size set to 1024 bytes and a default data rate of 9600 bps.
9. Fast Packet	Protocol insensitive (transparent) and compresses sync data. Utilizes statistical multiplexing techniques across the composite link such as other sync protocols (such as DLC and BISYNC). If the use of the equipment is at maximum, you may wish to select the TDM option, which reserves bandwidth.
10. TDM	Protocol insensitive. Designed for priority devices which require reserved bandwidth across the composite link (dedicated bandwidth).

Note: Tail circuits are supported at rates up to 38.4 Kbps when one side is set for internal clocking and the other side is set for external clocking. Do not configure a higher data rate.

- Notes:**
- Once you have completed your selection from the menu, you **must** do a node reset selecting the *current configuration* option. You may configure all sync ports before performing a reset.
 - If you change protocols, be sure to configure both ends of the channel with the same protocol. Perform a node reset on both units. (When changing protocol, the channel cannot be connected.)

Sync Channel Characteristics

Follow this menu path to set the sync channel characteristics.

COMMAND FACILITY MAIN MENU

3 CONFIGURE LOCAL NODES

CONFIGURE LOCAL NODES

3 SYNC CHANNEL

Enter your sync channel number.

ENTER NODE ID/CHANNEL # (^X TO ABORT): *NODE_A/A2*

SYNC CHANNEL CHARACTERISTICS

(see Table below)

Note: If you see CONFIGURATION INHIBITED and WRONG CHANNEL TYPE messages, it is likely that a reset was not performed after changing the port configuration to sync. Abort this process and perform a node reset before returning to this sequence.

Each sync protocol (selected during port configuration) has a different Sync Channel Characteristics Menu. Table 5-1 describes all of the options on all of the menus.

Note: It is recommended that you set the rate to 19,200 bps or higher. On speeds lower than 19,200, the block size should be short. For the 5000E/6 modules, do not exceed a sync data rate of 19,200 bps.

Protocol	NetRunner 75E	NetRunner 500ET, 1000E, 2000E and 2000ED
ASCII Bisync, EDCDIC Bisync, H-P Sync	1200-19,200	1200-19,200 ¹
RTS/CTS, MICOM DLC, Sync-Pad ²	1200-19,200	1200-48,000 ¹
DLC	1200-19,200	1200-64,000
MICOM Voice	9600-14,400	9600-14,400
Fast Packet	1200-38,400	1200-64,000
TDM ³	1200-38,400	1200-64,000
¹	System displays up to 64,000, but do not select more than the above stated rate.	
²	It is recommended that you increase the number of Trailing Pad Characters to the maximum for higher data rates (19.2 Kbps and higher).	
³	Tail circuits on TDM are supported at rates up to 38,400 bps when one side is set for internal clocking and the other side is set for external clocking. Do not configure a higher data rate.	

Table 5-1. Sync Channel Characteristics Option Selections

Option Name	Option Number	Protocol	Default	Description
Data Rate	1	DLC, ASCII Bisync, EBCDIC Bisync, H-P Sync, RTS/CTS, Sync-Pad, MICOM DLC, Fast Packet, TDM	2400	Sets data rate (in bps) for the user channel. See table on page 5-4 for available rates.
		MICOM Voice	9600	
Channel Clocking	2	DLC, ASCII Bisync, EBCDIC Bisync, H-P Sync, RTS/CTS, Sync-Pad, MICOM DLC, MICOM Voice, TDM	Tx-Internal/ Rx-Internal	Sets the port's source for a receive and transmit clock.
Maximum Transmit Block Size ¹	3	DLC, ASCII Bisync, EBCDIC Bisync, RTS/CTS, Sync-Pad	512	Sets the block size in bytes of data to the unit from the attached device.
		H-P Sync	9876	
		MICOM Voice	1024	
Maximum Receive Block Size ¹	4	DLC, ASCII Bisync, EBCDIC Bisync, RTS/CTS, Sync-Pad	512	Sets the block size in bytes of data to the attached device from the unit.
		H-P Sync	9876	
		MICOM Voice	1024	
Interface Type	5	DLC, ASCII Bisync, EBCDIC Bisync, H-P Sync, RTS/CTS, Sync-Pad, MICOM Voice	To DTE	Sets a port for To DTE to interface with data terminal equipment, and for To DCE to interface with data communications equipment such as a tail-circuit modem.
	3	MICOM DLC, TDM		
Carrier Mode	6	DLC, ASCII Bisync, EBCDIC Bisync, H-P Sync, Sync-Pad, MICOM Voice	Constant	Defines when carrier is held high, either constant or variable. (TDM and Fast Packet are set for constant and are not configurable.)
		RTS/CTS	Variable	
	4	MICOM DLC	Constant	

¹ Prompt only, not a menu.

Table 5-1. Sync Channel Characteristics Option Selections (continued)

Option Name	Option Number	Protocol	Default	Description
Sync Character ¹	7	ASCII Bisync	16	Sets the value of the leading sync character for the start of the block.
		EBCDIC Bisync	32	
		H-P Sync	16	
		RTS/CTS	FF	
	2	Fast Packet		
	4	TDM		
Sync Character ¹	#1 7	Sync-Pad	16	Sync character must match the 16-bit hexadecimal synchronization sequence.
	#2 8			
Number of Leading Syncs ¹	8	ASCII Bisync, EBCDIC Bisync, H-P Sync, RTS/CTS	3	Sets the number of leading sync characters that the unit will generate on the output (0-9). This will allow the device on the selected channel to synchronize. Enter 0 to specify leading syncs as <i>transparent</i> . (Leading sync characters will not be <i>stripped out</i> .)
	9	Sync-Pad		
Pad Character ¹	9	ASCII Bisync, EBCDIC Bisync, H-P Sync, RTS/CTS	FF	Sets the value of the pad character (any alpha or numeric character). It precedes the sync character and follows the end of the block. It is used to pad the block.
	10	Sync-Pad		
Number of Leading Pad Characters ¹	10	ASCII Bisync, EBCDIC Bisync, H-P Sync	1	Sets the number of leading pad characters to be transmitted at the start of the block. This is used for a time delay (1-9).
		RTS/CTS	3	
	11	Sync-Pad	1	
Number of Trailing Pad Characters ¹	11	ASCII Bisync, EBCDIC Bisync, H-P Sync	2	Sets the number of trailing pad characters to be transmitted at the end of the block (1-9).
		RTS/CTS	3	
	12	Sync-Pad ²	2	

¹ Prompt only, not a menu.² For sync-pad protocol, you can configure 1-20.

Table 5-1. Sync Channel Characteristics Option Selections (continued)

Option Name	Option Number	Protocol	Default	Description
Buffer Control	9	DLC	None	Used to regulate data transmission from a device attached to a user channel depending on the system buffer utilization.
	12	ASCII Bisync, EBCDIC Bisync, H-P Sync, RTS/CTS		
	13	Sync-Pad		
	7	MICOM Voice		
	5	MICOM DLC		
Encoding	7	DLC	NRZ	Selects one of the two types of encoding, NRZ or NRZI, depending on the attached device.
Idle Fill	8	DLC	Flag Fill	Selects the unit output when the line is idle.
				- for IBM 3270 half-duplex, select <i>markfill</i>. - for AS/400 applications, set either <i>auto fill</i> (Modulo 8) or <i>A128 fill</i> (Modulo 128).
Clock Flow Control	10	DLC	Enable	Selects whether or not the local channel will use clocking to control attached devices.
	13	ASCII Bisync, EBCDIC Bisync, H-P Sync, RTS/CTS		
	14	Sync-Pad		
	6	MICOM DLC		
	8	MICOM Voice		
DSR Control	11	DLC	Normal	Selects whether the remote DTR changes appear on the local DSR or are ignored.
	14	ASCII Bisync, EBCDIC Bisync, H-P Sync, RTS/CTS		
	15	Sync-Pad		
	7	MICOM DLC		
	9	MICOM Voice		
	3	Fast Packet		
	5	TDM		

Table 5-1. Sync Channel Characteristics Option Selections (continued)

Option Name	Option Number	Protocol	Default	Description
Priority	12	DLC	Low	Selects the priority of the port, high or low.
	15	ASCII Bisync, EBCDIC Bisync, H-P Sync, RTS/CTS		
	16	Sync-Pad		
	8	MICOM DLC		
	10	MICOM Voice		
	4	Fast Packet		
Sync Claimed Bandwidth ¹	13	DLC	0	0-64000 bps; 0=disable feature. Sets the amount of bandwidth (in bps) reserved for the port. The port that initiates the force connect (the <i>from node/channel</i>) sets the bandwidth claim for the channel. ² Since the maximum available bandwidth differs by protocol, refer to the table on page 5-4 for additional information.
	16	ASCII Bisync, EBCDIC Bisync, H-P Sync, RTS/CTS		
	17	Sync-Pad		
	9	MICOM DLC		
	11	MICOM Voice		
	5	Fast Packet		

Note: To return to the previous menu, Configure Local Nodes, enter a **P**.

¹ Prompt only, not a menu.

² If done in Command Facility. If NETMan makes the connection, either side could establish claimed bandwidth.

Sync Bandwidth Management

This feature permits you to budget the available link capacity for connections through the network. By assigning an appropriate claim for bandwidth, you prevent excessive overbooking of the link. When all link capacity is claimed, subsequent connections will not be completed (remain in CIP state).

SYNC CHANNEL CHARACTERISTICS

☐ SYNC CLAIMED BANDWIDTH

This feature is available on all protocols except TDM and on sync connections where both sides are Release 4.0 or higher. In the event that the link does not have enough bandwidth available for a requested sync connection, the connection will not be completed. This feature is enabled in the Sync Channel Characteristics Menu via the Sync Claimed Bandwidth option. When you select that option, the following prompt will display:

ENTER SYNC CLAIMED BANDWIDTH [0]:

Enter the amount of bandwidth in the range of 1-64000 (bps) required for the sync channel. The last number (ones column) rounds to the lowest 10; for example: You configure 1001, the display will show 1000; when configured for 1026, it will display 1020.

The port that initiates the connection is the one that sets the claimed bandwidth value for the channel. This means that when you force connect two ports from the Command Facility, the one which is input first (at the *from node/channel* prompt) is always the initiating port. In the case of NETMan, the initiating port may be either port; therefore, it is recommended that this parameter be set to the same value on each end of the channel. If the feature is enabled, the sync channel will make a switched virtual circuit (SVC) at the time of force connection; its path will be fixed through the network. The feature can be disabled by entering a zero (0) at the prompt; this is the default. If the feature is disabled, data will be sent via a datagram which means the path of the connection may change due to network congestion.

Should the port's configuration be altered while the port is force connected, the new values will not take effect until the port is force connected (reconnected) again.

Control Signals

A synchronous channel supports four control signal pairs necessary to support both direct-connected and modem applications: DTR/DSR, BO/RI, RTS/CD and Pin 11/CTS. The first two pairs (DTR/DSR and BO/RI) are passed end to end in the network; their levels are set by the attached devices. The last two (RTS/CD and Pin 11/CTS) are interpreted and generated locally by the unit. The particular operation of these signals depends upon the protocol selected, interface type and the carrier mode configured by the operator.

To DTE/To DCE Channels

SYNC CHANNEL CHARACTERISTICS



INTERFACE TYPE

Each port must be configured independently at each end. This allows the flexibility for a *TO DTE* interface to a computer and for a *TO DCE* interface to a tail circuit modem. See Tables 5-2 and 5-3 for pin assignments and DCE and DTE local channel interfaces.

When a port is configured TO DCE, CTS must be *on* from the attached modem (to enable output from the unit). This allows for the RTS/CTS delay, which varies on different modems.

When a port is configured TO DTE, the unit turns CTS *on* in response to RTS *on* from the attached terminal equipment. If CTS buffer control is selected, CTS may be delayed up to 250 ms after RTS is raised. See Tables 5-2 and 5-3 for pin assignments and DCE and DTE local channel interfaces.

Table 5-2. CCM and 6-Channel CEM¹ Local Sync Channel Interface Configured to DTE

NetRunner Pin	I/O	Constant Carrier Mode	Controlled Carrier Mode	DTE Pin	I/O	Signal
4	I	<i>Off-to-on</i> transition raises CTS. <i>On-to-off</i> transition forces CTS off.		4	O	RTS
5	O	Set <i>on</i> after RTS goes <i>on</i> . Set <i>off</i> when RTS goes <i>off</i> .		5	I	CTS
8	O	Forced <i>on</i>	Set <i>on</i> when unit has output data. Set <i>off</i> when all data delivered.	8	I	CD
22	O	2 Seconds <i>on</i> /4 seconds <i>off</i> when <i>start ring</i> frame received from remote unit. It is held <i>off</i> when <i>stop ring</i> frame is received from remote unit or when DTR is <i>on</i> (Bell 103 emulation).		22	I	RI
20	I	Send changes to remote unit as detected. DTR <i>on</i> holds RI <i>off</i> .		20	O	DTR
6	O	Change as detected by remote unit.		6	I	DSR
25	I	Send changes as detected by remote unit.		25	O	Busy
11	I	Not used	Not used	11	O	Unassigned
15	O	Not affected by carrier mode.		15	I	Tx Clock
17	O	Not affected by carrier mode.		17	I	Rx Clock
18	I	Not affected by carrier mode.		18	O	External Rx Clock
24	I	Not affected by carrier mode.		24	O	External Tx Clock

Key:
 I = Input
 O = Output

¹ 5000E/6 and 5000E/6DMA sync/async module only

Table 5-3. CCM and 6-Channel CEM¹ Local Sync Channel Interface Configured to DCE

NetRunner Pin	I/O	Constant Carrier Mode	Controlled Carrier Mode	DTE Pin	I/O	Signal
8	O	Held <i>on</i>	Leads output data.	4	I	RTS
11	I	...	Must be <i>on</i> to enable data output.	5	O	CTS
4	I	...	Ignored (except in RTS/CTS mode)	8	O	CD
25	I	Start ring frame is sent to remote when off-to-on transition is detected. Stop ring frame is sent to remote if no transition is detected for three seconds.		22	O	RI
6	O	Change as detected by remote unit.		20	I	DTR
20	I	Send changes as detected to remote unit.		6	O	DSR
22	O	Changes as detected by remote unit.		25	I	Busy
5	O	...	Follows unassigned input at remote end.	...	...	Unassigned
15	O	Not affected by carrier mode.		...	...	External Rx Clock
17	O	Not affected by carrier mode.		24	I	External Tx Clock
18	I	Not affected by carrier mode.		15	O	Tx Clock
24	I	Not affected by carrier mode.		17	O	Rx Clock

Key:
 I = Input
 O = Output

¹ 5000E/6 and 5000E/6DMA sync/async module only

Channel Clocking Signals

The receive/transmit clock signals may be set to one of four combinations: Tx-Internal/Rx-Internal, Tx-Internal/Rx-External, Tx-External/Rx-Internal, Tx-External/Rx-External. See Table 5-4 for applications of the clock signals.

Important

The data rate **must** be configured to match the rate of the external clock source.

Table 5-4. Synchronous Clocking

Configuration Type	Description of Use	Cable Diagrams for Clocks ¹	MICOM Cable Model Number
Normal Synchronous or Cascade To DTE Tx Clock Internal Rx Clock Internal	Used when DTE is co-located with unit. Unit supplies Tx and Rx clocks.	Unit DTE 15 — Tx Clock —> 15 17 — Rx Clock —> 17	5000C/5340 5000C/5343
Normal Synchronous To DCE Tx Clock External Rx Clock External	Used when tail circuit synchronous modem or DCE is attached to unit. DCE supplies both clocks.	Unit DCE 15 & 17 not used 18 ← Rx Clock — 15 24 ← Tx Clock — 17	5000C/5341
Normal Synchronous To DCE or DTE Tx External Rx Internal	Used when attached device is providing the Tx clock and the unit is providing the Rx clock.	Unit DCE/DTE 15 —————> 2,3 17 — Rx Clock —> 2,3 24 ← Tx Clock — 2	Depending on attached device 5000C/5340 (DTE) 5000C/5341 (DCE) 5000C/5343 (DTE)
Special Synchronous To DCE or DTE Tx Internal Rx External	Used when attached device is providing the Rx clock and the unit is providing the Tx clock.	Unit DCE/DTE 15 — Tx Clock —> 2 17 —————> 2,3 18 ← Rx Clock — 2	Customer supplied cable

¹ Tx clock and Rx clock are used to indicate on which lines the unit supplies or accepts the transmit and receive clock signals. The Tx and Rx clocks are always named respective to the port.

² Pin assignments depend on the attached device.

³ Unit will output the clock.

Copy Channel Parameters

By using the copy channels selection you may configure a single port or range of sync, async or voice/fax ports. This option can save you time if the ports you are configuring match (or closely resemble) a port you have already configured. You may copy parameters within the unit or to a locally-connected MICOM mux; you cannot copy to another Integration unit.

Note: Source and destination ports must be a like kind (async to async, sync to sync) and protocol (sync DLC to DLC). If they are not, an error message will display and you must start again.

COMMAND FACILITY MAIN MENU

☒ 3 CONFIGURE LOCAL NODES

CONFIGURE LOCAL NODES

☐ COPY CHANNEL PARAMETERS

Enter your source channel number.

ENTER SOURCE NODE ID/CHANNEL # (^X TO ABORT): *NODE_A/B1*

Enter your destination (either a single port or a range of ports).

ENTER NODE ID/CHANNEL (OR RANGE OF CHANNELS) (^X TO ABORT): *NODE_A/B2*

You can now return to the channel configuration menu and modify specific parameters if necessary. You should verify the configuration. Refer to View Configuration, page 7-8.

Async Channels

Ports (channels) A2-A6 (A2-A4 on NetRunner 75E) and all CEM module ports are by default async. It is unnecessary to configure those ports which are by default async, unless they have been configured as sync or a link. If port configuration is necessary, be sure to do a node reset.

To access the Async Channel Menu, follow this path:

COMMAND FACILITY MAIN MENU

3 CONFIGURE LOCAL NODES

CONFIGURE LOCAL NODES

2 ASYNC CHANNEL

Enter your async channel.

ENTER NODE ID/CHANNEL # (^X TO ABORT): NODE_A/B5

ASYNC CHANNEL

1. CHANNEL CHARACTERISTICS
2. CHANNEL FEATURES
3. EXTENDED FEATURES
4. SWITCHING PARAMETERS

The Async Channel Menu is displayed showing four menu options:

- Channel Characteristics refer to page 5-16
- Channel Features refer to page 5-19
- Extended Features refer to page 5-20
- Switching Parameters refer to page 5-30

Note: Parameter changes on switched ports will take effect after the port is disconnected; parameter changes on force-connected ports will take effect immediately.

Async Channel Characteristics

The pathway to this menu is shown on page 5-15. The options are similar to the Local Channel Configuration menu (from Command Mode).

Option	Default	Description
1. Data Rate	9600	Sets the data rate (in bps) for the port. (ABR=autobaud rate detection, refer to page 5-17.) Note: It is recommended that ports attached to a host port be set for a fixed speed.
2. Code Level	8	Sets the bits per character for data and messages.
3. Parity	None	Depending on the code level selected, displays one of two possible parity menus. (Refer to page 5-18.)
4. Stop Bits	1	Selects the number of stop bits inserted at the end of a character.
5. Echo	Off	Enables or disables the echo function. ¹
6. Channel End to Host/to Terminal	Terminal	Configures the port for a host or a terminal connection.
7. XON Character	DC1	Selects the character for the XON function.
8. XOFF Character	DC3	Selects the character for the XOFF function.
9. Buffer Control	XON/XOFF	Sets the method the unit uses to control data flow from the attached device.
10. Flow Control	XON/XOFF	Sets the method the attached device uses to control data flow from the unit. ¹
11. CR Delay ²	0	} Configures a delay after a Carriage Return (CR), a Line Feed (LF) and/or a Form Feed (FF).
12. LF Delay ²	0	
13. FF Delay ²	0	

¹ Valid only for ports configured in option 6 as channel end to *terminal*.

² Delay values are configured in number of characters (0-99 characters) to account for required mechanical actions of the equipment attached to the port.

Autobaud Rate Detection (ABR)

The unit has the capability of automatically determining the data rate of a port in the range of 50 – 19200 bps by dynamically examining the first (sign-on) character. In addition, the unit will pass the sign-on character to a host computer, if the port configuration is set in the following manner:

- *Port where the sign-on character is originated.*

Data Rate = ABR

Channel End To Host/To Terminal = Terminal

- *Port where the sign-on character is received.*

Data Rate = ABR

Channel End To Host/To Terminal = Host

Table 5-5. Autobaud Rate Sign-on Characters

Rate	Code Level (bits)	Stop Bits	ABR Sign-on Character
50	5	1.5	<cr>
75	5	1.5	<cr>
110	8	1	<cr>
150	8	1	<cr>
200	8	1	<cr>
300	8	1	<cr>
600	8	1	<cr>
1200	8	1	<cr>
1800	8	1	<cr>
2400	8	1	<cr>
4800	8	1	<cr> or Space
9600	8	1	<cr>
19200	8	1	<cr>

Code Level and Parity Conversion

The unit's code level includes parity in its data bits as shown in the following table.

Unit		Actual	
Code Level ¹	Parity	Data Bits	Parity Bit ²
9	E,O	8	E,O
8	N	8	N
8	E,O,M,S	7	E,O,M,S
7	N	7	N
7	E,O,M,S	6	E,O,M,S
6	N	6	N
6	E,O,M,S	5	E,O,M,S
5	N	5	N

Key: E = Even O = Odd
M = Mark S = Space
N = None

¹ includes parity bit
² N = no parity bit; E, O, M, S = 1 bit

The code level on each side of the channel (local and remote ports)

- must be the same
- must match the attached devices.

Note: If you select a code level of 5 or 6: ABR (data rate) and XON/XOFF (flow control) is not supported. For code level 5, you must set the parity to *none*.

Parity Conversion

Parity conversion is supported for all switched and force-connected async ports (Release 3.0 and later). Space, mark, even, and odd need not match on the local and remote end of the channel. Parity errors will be detected on channels configured for *odd* or *even* parity regardless of the code level; those characters will be discarded. Channels with characters configured for *mark*, *space* or *none* will be forwarded, even if received in error.

Important

To interface and remain transparent with a MICOM mux or a Release 2.5 unit, both ends of the channel must have the same code level and parity (parity conversion is not supported). Additionally, the devices at each end *must* match.

Async Channel Features

The pathway to this menu is shown on page 5-15. The following options are available:

Option	Default	Description
1. Priority	High	Determines whether port is high or low priority in reference to other async ports.
2. EIA Control	Enable	Offers the option of recognizing or ignoring the control signals from the attached device.
3. Smooth Scroll	Off	Supports the DEC VT100 Smooth Scroll terminals.
4. Tandem	No	Supports Tandem Non-Stop computer data flow operation.
5. Flow Control Strip	Pass	Either <i>passes</i> or <i>strips</i> the flow control signals.
6. HP ENQ/ACK	No	Supports the Hewlett Packard HP-3000 View Systems.
7. Sync Loss Disconnect	No	Determines whether a channel will be disconnected in the event the unit detects a sync loss on a link to which the port is connected.
8. Command Mode Entry Sequence	^X Break	Determines the keying sequence available to the channel user for accessing the Command Mode.
9. Command Mode Access	Enable	Enables/disables access to the Command Mode for the port being configured.
10. Command Facility Main Menu Access	Enable	Enables/disables access to the Command Facility Main Menu for the port being configured.
11. Local Channel Configuration	Enable	Enables/disables access to the Local Channel Configuration Menu for the port being configured.

To return to the previous menu (Async Channel Menu), enter a **P**.

Async Channel Extended Features

The pathway to this menu is shown on page 5-15. The following options are available.

Option	Default	Description
1. Data Compression	Enable	Selects whether compression will be enabled. When enabled, the unit compresses a block of data when transmitting and decompresses the data when receiving. Fewer bytes are required for the transfer, which increases the composite throughput. Adaptive Huffman Compression algorithms are used. Both local and remote ports must be configured for data compression.
2. Remote CTS Control	Forced On	Allows the remote CTS signal to be Forced On or transparent. Specific use is for ports which are force connected. Selection depends on attached devices (Forced On for DTE devices and Normal for DCE devices).

Switching Configuration

Actual *switching functions* are for async and voice/fax channels; every sync channel must (and the others may) have a force connection. In the following paragraphs, these subjects will be described:

- Sync force connections
- Async connections
- Classes
- Dialog messages
- Port contention and queuing

Appendix A contains blank worksheets to record your switching configuration.

Switching Control

The Switching Control Menu controls the async, sync, and voice/fax ports and their connections.

COMMAND FACILITY MAIN MENU

5 SWITCHING CONTROL

SWITCHING CONTROL

1. DISABLE CHANNEL
2. ENABLE CHANNEL
3. FORCE CONNECT
4. FORCE DISCONNECT

When selected you will be offered the following options:

Option	Description
1. Disable Channel	Takes the async or voice/fax port out-of-service.
2. Enable Channel	Puts the async or voice/fax port into service.
3. Force Connect	Connects two idle or out-of-service ports or range of ports. (Use the Force Disconnect option to break a force connection.)
 CAUTION Do not use this option for virtual connections (LAN channels). It is not compatible with the Integration Router.	
4. Force Disconnect	Disconnects two ports (or a range of ports) which have been force connected.

Following is a discussion of the different applications and their requirements which involves the switching process and the Switching Parameters Menu.

Force Connections

The procedures for force connecting async and sync channels are the same. The two ports to be connected must be the same type of port (i.e., async to async, sync to sync, etc.). If a port is force connected, no other channel may access it through switching calls. **Do not force connect a LAN module.**

Force Connect Procedure

To make a force connection, follow this path through the menus.

Enter the channel # that is local to the Command Facility.

COMMAND FACILITY MAIN MENU

5 SWITCHING CONTROL

SWITCHING CONTROL

3 FORCE CONNECT

ENTER FROM NODE/CHANNEL # (OR RANGE OF CHANNELS) (^X TO ABORT): SIMI/A4

Note: If force connecting DLCIs, be sure to include the DLCI number following the port. For example: SIMI/A4.2132

You must be in the Command Facility of the node from which the force connect is going to be made. Otherwise an `Illegal Input` message will be displayed.

Enter the *to* channel (or channel and DLCI).

ENTER TO NODE/CHANNEL # (^X TO ABORT): SAC/A4

When successfully connected, the Switching Control menu is redisplayed.

- Notes:**
- If you force connect a channel already force connected, the new connection overrides the old connection.
 - Do not force connect ports that you know are inoperative or not in use. It may have an effect on the bandwidth use.
 - If you force connect voice/fax ports, the bandwidth setting (voice activated, continuous, or dynamic) and the digitizing rate must match at each end of the channel.

Disconnecting Force Connections

The procedures for disconnecting force connections are the same for all channels. When a channel is force disconnected, the status for that channel displays an *OOS* state.

Follow this menu path to disconnect a port:

COMMAND FACILITY MAIN MENU

5 SWITCHING CONTROL

SWITCHING CONTROL

4 FORCE DISCONNECT

Enter the port (or range of ports) you want disconnected.

ENTER NODE/CHANNEL # (OR RANGE OF CHANNELS) (^X TO ABORT): SIMI/A4

For each port disconnected, an event message will be generated. Disconnecting one side of the channel automatically disconnects the other side; you need only disconnect one side.

Note: You can also force disconnect DLCIs that have been force connected.



CAUTION

All current connections will be immediately disconnected if they fall within the range, **including your connection to the Command Facility via the LAN.**

Synchronous Connections

Sync ports *must* be force connected (an option on the Switching Control Menu). The connection may be between the local unit and the remote unit or it may be within the local unit. Follow the menus shown on page 5-22, *Force Connect Procedure*.

- Notes:**
- To change protocol, you must force disconnect the channel.
 - When force connecting, be sure that the protocols match. (Do not attempt to change protocols on one side only.) Be sure to reset the unit after reconfiguration.

When the connection is complete, the Switching Control Menu will reappear on the screen. Continue this process until all sync connections have been made.

To disconnect a channel, select the Force Disconnect option from the Switching Control menu.

Asynchronous Connections

The following five methods of switching are supported for async ports:

Force Connection	The network operator configures a dedicated connection between two ports in the network. The user will not have access to any other port when using this method.
Fixed Destination Class	The network operator configures the destination for the user's channel.
Node/Class	At the ENTER CLASS prompt the user enters a mnemonic, configured as a <i>class name</i> , which is defined as one or more ports in the network.
Matrix (Node/Channel)	At the ENTER CLASS prompt the user enters the destination node and the class desired.
	At the ENTER CLASS prompt the user enters the destination node and channel number desired.

Async Force Connections

In async force connections, the configuration of the port need not exactly match, however, both ports must be configured as async (and for the same character set). If a port is force connected, no other port may access it through switching requests.

The procedure to force connect two async ports was described on page 5-22, *Force Connections*. Once force connected, the only way to access the Command Facility is ^X <break> (or ^X ^Y, if enabled). You will not get the ENTER CLASS prompt.

Note: Set the Remote CTS Control (Extended Features menu) for the device attached to the port(s). If it is not, it may not be possible to connect to the Command Facility once the force connection is made.

Classes

A class is a name assigned to a group of one or more ports that may be used for similar purposes by network users (e.g., all ports connected to a specific application may be contained in a class). Classes may be viewed as hunt groups, where the user will be connected to any of the available ports in the group. The maximum number of classes per NetRunner unit is 64. Users can access port(s) by name, without having to know its physical location in the network.

Classes provide the following features:

- Secondary class is used if all ports in the primary class are busy
- Password protection on destination port access
- Configurable class messages
- Disconnection on inactivity timer (no data activity timeout)
- Port contention handling through first-come, first-serve queues (camp-on queues)

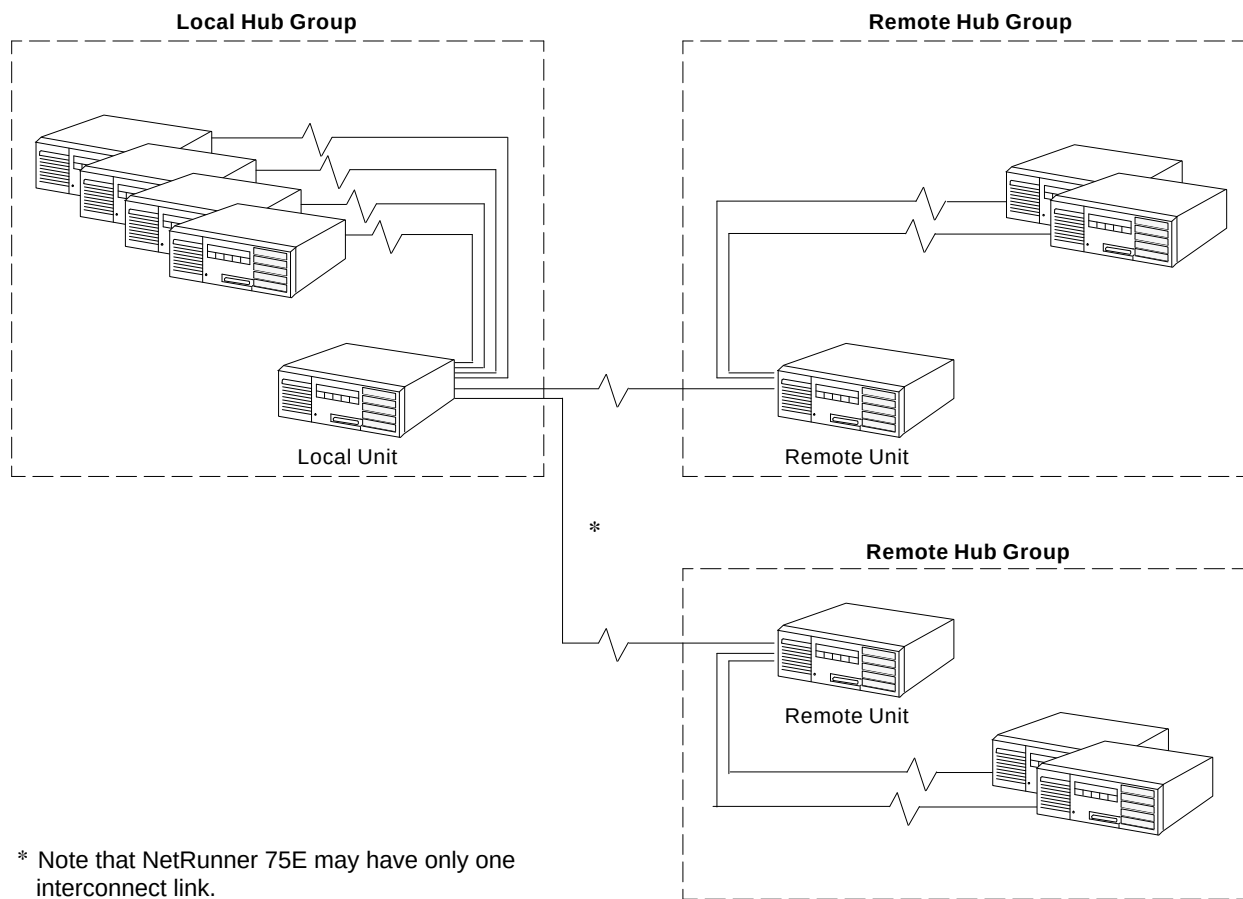
A port may be configured in only one class. A class does not need to be exclusive to any node – multiple nodes may offer the same class. In fact, this is desirable if multiple ports on multiple nodes are connected to the same application.

How the Class Request Works

When a class request is made, the process is as follows:

- Search through local hub group (see figure below) for primary class, then secondary class. If no available ports on local hub group, unit will place the call in queue for any available primary port or secondary class port.
- A call is made to remote unit(s), a CALL IN PROGRESS message displays. The unit searches the primary, then secondary class. If no available ports, unit will place the call in queue.
- When a connection is made, all other pending queue requests are cleared.

There is no way to determine which remote unit will be connected if class exists on more than one remote node.



Local and Remote Hub Groups

Planning a Class

The class worksheets in Appendix A will help you plan a class. Prior to configuring the classes, define which ports are to be grouped together and the following information:

Class Name	A group of ports that is searched when this class name is requested. Refer to Class Name Syntax in the paragraph titled <i>Class Names</i> , below.
	Note: When selecting a class, it must be unique. Switching class names and LAN class names may not be duplicated.
Secondary Class (if applicable)	An alternate group of ports, which will be searched should all ports in the primary class name be unavailable. The secondary class must already be defined as a class.
Class Password	The password assigned to each class. See Password Syntax, in <i>Password Protection</i> below.
Class Message	The message to be displayed after the connection is made. See <i>Class Message</i> , next page.

Class Names

Class Name Syntax	Class names may be up to eight (8) characters long. Only alpha characters (a-z, A-Z), numeric characters (0-9), and the underbar symbol (_) can be used. The first two characters must be alpha. Names are not case sensitive; therefore hp_acctg, HP_ACCTG and HP_Acctg are the same name.
-------------------	---

Password Protection

Password protection is available for all ports assigned to a class. If a password is assigned, the user will be prompted for the class password before being allowed to continue. After two unsuccessful password attempts, the call will be disconnected.¹ The factory default value is Null (no) password.

Password Syntax	Valid passwords must be alphanumeric characters and have a maximum length of eight characters. If no password is required (after it has once been configured), enter a space and carriage return at the password configuration prompt.
-----------------	--

¹ This is not true for ports configured for dedicated protocol. On dedicated protocol, there is no limitation.

Class Message

The Class Message is the message which displays when the user successfully connects to the requested class.

Class Message Syntax

This is a user-configurable message for which there is no default. Up to 31 ASCII characters (except for control characters) may be used. Special rules apply when entering the characters listed below into the class message:

Desired Character for Message	What to Input	Notes
^X	<esc> <ctrl>X	Without the <esc> key, ^X will abort the message.
ESC (escape)	<esc><esc>	To include an escape key in the text, it must be preceded by an <esc>.
; (semicolon)	<esc>;	To include a semicolon in the text, it must be preceded by an <esc>.
(carriage return, line feed)	;	Inserts a carriage return, line feed which counts as two characters.

Configuring the Classes

The following is the menu path to configure a class number, name, and password.

Enter class number, beginning with 1.

COMMAND FACILITY MAIN MENU

☒ 3 CONFIGURE LOCAL NODES

☐ CLASS PARAMETERS

ENTER CLASS NUMBER (^X TO ABORT): 1

Note: Class numbers are assigned numerically beginning with 1. If the next class number is not known, view the class list (by selecting the Classes option, from the View Configuration Menu).

Enter a class name.

ENTER CLASS NAME [current value] (^X TO ABORT): IRM

CLASS PARAMETERS MENU

1. CLASS NAME
2. SECONDARY CLASS
3. CLASS PASSWORD
4. CLASS MESSAGE
5. CLASS NO ACTIVITY TIMEOUT
6. DELETE CLASS

The following options are available:

Option	Default	Description
1. Class Name	n/a	Changes the name of this class.
2. Secondary Class	0	An alternate group of ports, which will be searched should all ports in the primary class name be unavailable. This is optional.
3. Class Password	n/a	Password associated with the class.
4. Class Message	n/a	Displays on user's screen after they connect to the class.
5. Class No Activity Timeout	0	A configured period of time (in minutes) after which the system will disconnect the port if there is no activity. The maximum time is 255 minutes.
6. Delete Class	n/a	Delete a class entirely.

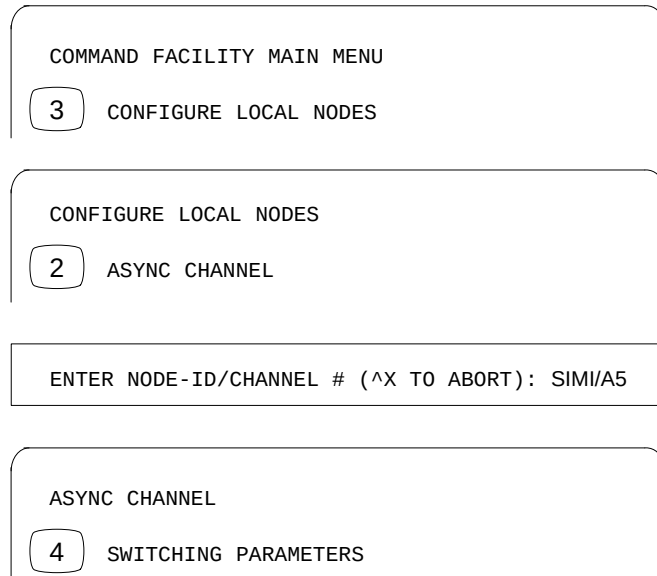
To view classes and their numbers, select the Classes option, from the View Configuration Menu.

To include a port as part of a class, select the Resource Class option from the Switching Parameters Menu (refer to page 5-30), and insert the class name.

To define a class that a port automatically connects to, select the Destination Node/Class option from the Switching Parameters menu (refer to page 5-30), and insert the class (or node/class) name.

Switching Parameters

To access this menu, follow this path.



The following options are available:

Option	Default	Description
1. Connect Protocol	Dedicated	Selects the connection protocol used.
2. Unbalanced Rates	On	Allows a connection to operate at different rates (speeds) at each end of the connection. <i>On</i> enables this function.
3. Call Inhibit	No	<i>Yes</i> inhibits the port being configured from initiating a call, making it a <i>called</i> port only.
4. Receive Inhibit	No	<i>Yes</i> inhibits the port being configured from receiving a call; therefore this port can only initiate calls (a <i>calling</i> port only).
5. Character Set	ASCII	Defines whether an ASCII or non-ASCII character set is defined. If non-ASCII is selected, either a destination class must be configured or Call Inhibit must be <i>yes</i> . <i>Do not configure a password for a non-ASCII configured port.</i>

Option	Default	Description
6. Matrix Switching	Enable	Permits or prohibits the port from making a matrix switching call connection.
7. Resource Class	n/a	If the port being configured is to be included as part of a class, enter that class at this prompt. If the port is to be assigned to connect to a specific class, enter that name under option 8, Destination Node/Class and leave this option blank.
8. Destination Node/Class	n/a	Defines the destination of the port being configured to a particular node and class. If the port is configured as part of a resource class, leave this option blank.
9. Channel Password	n/a	The password to gain entry to the port being configured (the syntax is the same as for class password). This is unrelated to the class password. The default is no password.

Connect/Disconnect Protocol, Channel Interfaces

The Connect Protocol menu, offers the following three physical connection protocols:

Option	Description
1. Dedicated	This option is used for terminals or computer ports which operate on data activity only. Must be used on line driver data channels (5000E/12LD).
2. DTR (Data Terminal Ready)	This option is used for terminals or computer ports which can control DTR to initiate or acknowledge call requests. This allows computer ports to delay incoming calls until ready. This option is also useful for tail-end leased line async modems where DSR or CD is crosswired to DTR. (EIA Control must be <i>enabled</i> .) Note: Any DTR-configured terminal should use \$CMD to enter the Command Facility.
3. Auto	This option is used with dial up modems and will emulate a dial up modem to a computer port (EIA Control must be <i>enabled</i> .)

Feature Matching Capability

Feature matching automatically selects and sets the minimum feature set for the connecting async ports during all switching operations, other than force connections.

Features automatically converted for async channels include the following:

- *Speed.* Called and calling ports do not need to have the same speeds unless unbalanced rates are set to *off*. The unit will flow control the faster port to prevent overrunning the slower port.
- *Flow Control / Buffer Control conversion.* Ports with different flow control and buffer control mechanisms will be converted through the unit.

Note: Ports using no flow control connecting with those using character (DC1/DC3, DC2/DC4 and so forth) flow control may have problems if they use the complete ASCII code set, since the flow control characters will not be stripped out of the data stream.

- *Parity Conversion.* Even, odd, mark and space will be converted automatically at the receiving NetRunner to match the required parity. Parity conversion also works on force-connected channels. (Parity is part of the Channel Characteristics option of the Async Channel menu. Refer to page 5-15.)

Making a Connection

Force Connection

Force connection is an automatic process, transparent to the end user. After login, the connect will be made. To disconnect a force connection, use the Force Disconnect option of the Switching Control menu.

Initial Connection Procedure

For the methods of connection other than force connection, the initial steps are the same for connecting to the unit or its MICOM muxes.

1. Turn on terminal and enter the sign-on character (if applicable).
2. ENTER PASSWORD prompt will display (if one has been configured); enter password.

If configured, the welcome banner will display to show you that the connection to the unit is complete. The CONNECTED message will display.

Fixed Destination Connection

If a port is configured for fixed class destination, the unit will automatically attempt to connect to the designated primary class after the initial steps have been completed (see above).

Disconnecting

Press the <break> key three times within six seconds.

Class Connection

1. Complete the initial steps on page 5-32.
2. At the ENTER CLASS prompt, enter the class name to which you wish to connect.
3. At the class password prompt, enter the password or a carriage return (if no password is configured).
 - *If the port is not available*, the user's screen will display:

Waiting Q= <i>n</i>	Ports for that class are in use; you are in queue position <i>n</i> . Refer to page 5-35 for additional information.
Unavailable	Class exists, but is not in service.
Unassigned	Class is unknown in the network or the password may be incorrect.
 - *If the port is available*, the Class Message (if configured) and CONNECTED message will display.

Disconnecting

Press the <break> key three times within six seconds. The disconnect message will display on the calling port's screen.

Node/Class Connection

1. Complete the initial steps on page 5-32.
2. At the ENTER CLASS prompt, enter the node/class name to which you wish to connect.

Note: All ports configured for the specified class in this specified unit's hub group will be included in the search.
3. At the class password prompt enter the password or just a carriage return (if no password is configured).
 - *If the port is not available*, the screen will display,

Waiting Q= <i>n</i>	Ports for that class are in use; you are in queue position <i>n</i> . Refer to page 5-35 for additional information.
Unavailable	Class exists, but is not in service.
Unassigned	Class is unknown in the network or password may be incorrect.
 - *If the port is available*, the Class Message (if configured) and CONNECTED message will display.

Disconnecting

Press the <break> key three times within six seconds. The disconnect message will display on the calling port screen.

Matrix Connection

- Notes:**
- Do not attempt to matrix connect to any force connected port.
 - Matrix switching can be disabled on a per channel basis (Switching Parameters Menu).
1. Complete the initial steps on page 5-32.
 2. At the ENTER CLASS prompt, enter the full node ID/channel number of the port to which you wish to connect.
 3. If the destination port has been configured as a class, you will be prompted for a class password; enter the password.
 - *If the port is not available*, the screen will display,

Busy	Port is in use, try again.
No Answer	No answer from the destination port. • Remote port did not respond to connection protocol. • No response within the call time out period, although port is known by the local unit.
Unavailable	Port exists, but is not in service or receive inhibit is enabled.
Unassigned	The node or port is unknown to the network or the password may be incorrect.
 - *If the port is available*, the Class Message (if configured) and CONNECTED message will display.

Disconnecting

Press the <break> key three times within six seconds. The disconnect message will display on the screen.

Port Contention/Queueing

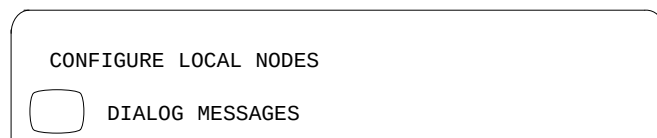
Port contention allows multiple users access to a limited number of resources.

If no resource is idle, the user will be placed in queue for the busy ports in the primary or secondary class.

Once in the camp-on queue, the user may receive the current queue message (Waiting Q = your place in the queue) by typing in any printable ASCII character or a <cr>. The user may also exit the queue (and return to the resource prompt) by typing a <break> key.

Dialog Messages

These are configurable messages and prompts displayed for information during asynchronous switching operation, confirmation, or requesting input. Some dialog messages have a default message, others do not. You may elect to change the message. To configure your own dialog messages, access the Dialog Messages Menu.



Dialog Message Syntax

Dialog Messages vary in maximum length. Alphanumeric characters (A-Z, 0-9), spaces and all symbols may be used. Messages are not case sensitive.

Note: There is one additional Dialog Message called Class Message, which does not appear on this menu (refer to page 5-28).

Special rules apply when entering the characters listed below into the dialog message. These rules are the same for Class Messages and are shown on page 5-28.

The following dialog messages are available:

Option	Default	Description
1. Channel Password	Enter Password:	Asks the user for the password associated with the sign-on port. It is the first dialog message that appears on the user's screen when attempting connection to the network. If no password is defined, this message will not display. The maximum length of the message is 31 characters.

<u>Option</u>	<u>Default</u>	<u>Description</u>
2. Welcome	(No default message)	May be sent to a port when the user first successfully connects to the unit. The maximum length of the message is 58 characters.
3. Class Request	Enter Class:	Asks the user for the class name of the destination port. The maximum length of the message is 31 characters.
4. Class Password	Enter Class Password:	Asks for the password of the requested class. If no password is configured for the class, the user should respond with a carriage return. The maximum length of the message is 31 characters.
5. Connected	Connected	Displays when a connection to any resource has been established. The maximum length of the message is 31 characters.
6. Queue	Waiting Q=n	User is waiting for a connect to a port. The user types a printable character or <cr> and the message displays on the screen indicating the user's place in the queue. The maximum length of the message is 16 characters. The value <i>n</i> following the queue message is the number of your place in queue.
7. Busy	Busy	Sent only to users using matrix switching when the requested port is in use by another network user. The maximum length of the message is 16 characters.
8. Disconnected	Disconnected	Displays when the call has been disconnected. It is only sent to the call originator using switching. (This is not for force connections.) The maximum length of the message is 16 characters.

<u>Option</u>	<u>Default</u>	<u>Description</u>
9. No Answer	No Answer	Indicates there is no answer from the destination port. The maximum length of the message is 16 characters.
10. Unavailable	Unavailable	Sent when a user requests a resource which exists, but is not in service (operational). The maximum length of the message is 16 characters.
11. Unavailable	Unavailable	Displays when a node, class, or channel is unknown in the network. It could also mean that a password for the class may be incorrect. (This message generally indicates a typing or configuration problem.) The maximum length of the message is 16 characters.
12. Incompatible	Incompatible	Sent when any connection is attempted that is not compatible with the configuration. The maximum length of the message is 16 characters.
13. Call in Progress	Call In Progress	Displays while a call is in the process of being connected. The maximum length of the message is 16 characters.

LCD/Keypad 6

(Not for NR75E model)

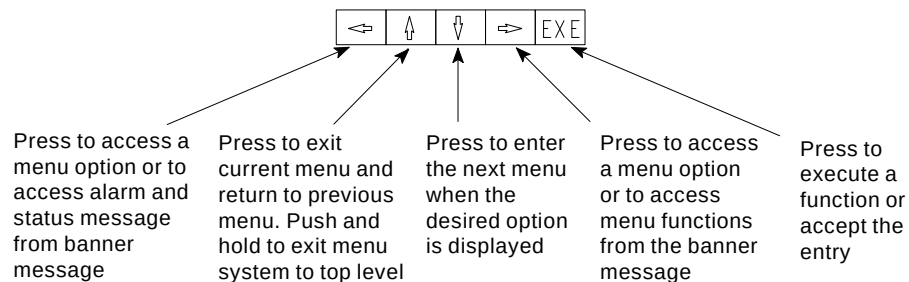
The NetRunner unit includes an LCD (Liquid Crystal Display) and a keypad on the front of the unit. The 80-character LCD consists of two 40-character lines. The LCD is used to display status and alarm messages, as well as diagnostic and minimal configuration menus. When you turn on the unit, the LCD will display the current system time and a current alarm or event (if any) and the time of its occurrence.



8:15:10 Dial Connection Made Link A1 12:01:00

Sample LCD Display

Functions performed at the keypad are for the local unit only (no remote functions are possible).



Refer to sheet 2 of the Menu Flow Diagram for all the menu options.

Blinking Backlight

When working in the menus, should the backlight begin blinking, it means that there is an alarm message. You can exit to the top level (Banner Message Display) and read the message or clear the blinking backlight at the Clear Latched Alarms option (at the Systems Menu). Another way to clear the display is through the Command Facility Main Menu by selecting the Clear Alarm Displays option.

Keypad Reset

The unit can be manually reset from the keypad by pressing the two outside keys $\Leftarrow$ and **EXE** at the same time and holding them for two seconds. This is a hardware reset (warm start), and the current configuration will remain unchanged, except for the time and date display which resets. This reset does not require a password.

Within the Administration Menu of the LCD, there is a system reset (warm start – current configuration, and cold start – default configuration), a link reset, and channel reset function.

LCD/Keypad Password Protection

When configured, the LCD/Keypad password protects all the administrative, diagnostic, and configuration functions, allowing access only to review the alarm and status messages in the system message log.

The password may be a series of up to eight up, down, left, right arrows followed by the **EXE**cute key. This sequence is entered in the Command Facility as U, D, L, R characters followed by a <cr>. For example, after configuring UUDL<cr> as the password, you would enter 2 up arrows, a down arrow, a left arrow and **EXE**cute at the LCD/keypad when prompted for the password.

Do not use commas when configuring. If no password is required, enter a space during the password configuration.

The LCD/Keypad password is configured through the Command Facility, as follows:

```
graph TD; A[COMMAND FACILITY MAIN MENU] -- "3" --> B[CONFIGURE LOCAL NODES]; B -- " " --> C[PASSWORDS]; C -- "3" --> D[LCD/KEYPAD];
```

The diagram illustrates the menu navigation for configuring the LCD/Keypad password. It consists of three stacked rectangular boxes representing the Command Facility interface. The first box, titled "COMMAND FACILITY MAIN MENU", shows a selection of "3" next to "CONFIGURE LOCAL NODES". The second box, titled "CONFIGURE LOCAL NODES", shows a selection of " " (space) next to "PASSWORDS". The third box, titled "PASSWORDS", shows a selection of "3" next to "LCD/KEYPAD".

Enter the desired sequence for the password.

Command Facility Administration 7

Depending on your equipment, the functions discussed in this section may be accomplished via

- the dedicated command port
- a floating command port
- the NETMan Network Management product.

This section assumes you are using the floating command port. The first method requires that your unit be equipped with an optional NMS module. Refer to the NMS manual. For administration information using NETMan, refer to the NETMan User's Manual.

Command Facility Passwords

The Command Facility passwords provide different types of security for access to the Command Facility.

Global:	Allows access to all functions.
Status:	Allows access only to view, status, and exit functions.
LCD/Keypad:	Allows access to all LCD/Keypad functions. This password is a series of keypad entries. For instructions, refer to page 6-2.



CAUTION

Record these passwords. If they are forgotten, a cold start is required to reinstate the system defaults and clear the user-defined passwords.

Note: Be aware that a connection to the Command Facility Main Menu cannot be made if the async channel parameter Command Mode Access is disabled (in the Channel Features Menu of the Async Channel Menu).

Syntax for Global and Status Passwords

Up to eight alphanumeric characters can be used for passwords. Erase a password by entering a space and then <cr> at the password prompt. The default value is no password.

Global and Status Password Configuration Procedure

Select option.

Enter the alphanumeric characters.

COMMAND FACILITY MAIN MENU [node ID]

☐ 1. GLOBAL (ALLS)
 ☒ 3. CONFIGURE LOCAL NODES

☐ PASSWORDS

PASSWORDS

1. GLOBAL (ALLS ANY COMMAND OR TEST)
 2. STATUS (VIEW, STATUS ONLY)
 3. LCD/KEYPAD

ENTER PASSWORD (^X TO ABORT):

Configuring the Command Facility Parameters

The Command Facility Parameters Menu controls such parameters as the system time, date, system reports, and the no activity timeout.

Event and alarm message reporting turns on or off the report of a normal change of state in the system, or the report of a vital error in the system. A list and description of all the alarms is in Appendix B, Messages.

Note: Not all options are available to the NetRunner 75E. The option numbers vary.

COMMAND FACILITY MAIN MENU [node ID]

☐ 1. GLOBAL (ALLS)
 ☒ 3. CONFIGURE LOCAL NODES

☐ COMMAND FACILITY PARAMETERS

COMMAND FACILITY PARAMETERS

1. TIME
 2. DATE
 .
 .
☐ DAY OF THE WEEK

You will probably want to set the time and date and the day of the week options. Time is set using a 24-hour clock, hh:mm:ss, so 1:00 pm should be entered as 13:00:00. Date is set in mm/dd/yy (month/day/year) format.

The no activity timeout is a timer that monitors activity on the Command Facility port and disconnects the channel if the time is exceeded. The time out is programmable for 1-60 minutes, or 0 for none.

Once these and any other parameters you require have been configured, you can press M to return to the Command Facility Main Menu.

Reset

A reset is defined as a restart to a known point. During configuration a reset establishes the new point. To clear a channel, node or link that might be hung up, a reset may be necessary. Resets interrupt the normal flow of traffic, so choose the one which is the least invasive. For instance, to clear one channel, perform a channel reset, instead of a node reset which interrupts the whole network.

There are two ways to perform a node reset on the unit, through the Command Facility Main Menu (software reset) and from the front of the unit (hardware reset).

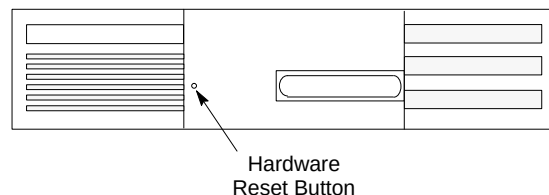
- Notes:**
- Performing a reset on a channel or a node terminates the Command Facility on that port if you entered via \$CMD.
 - Resetting the unit (cold or warm) resets the status/statistic counters. All previous statistics are lost.

Hardware Reset on NetRunner Unit

The hardware reset is performed at the front of the unit. The actual procedure depends on which model you have.

Without LCD/Keypad

With a narrow or pointed object (such as a pen), carefully depress the recessed reset button and hold it for two seconds.



Hardware Reset without LCD/Keypad

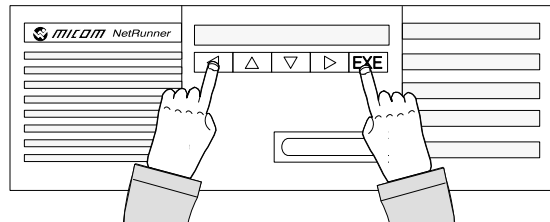
Keypad Reset

There are two types of node resets available from the keypad, a hardware reset (which does not require a password), and the reset performed from inside the menu functions software (refer to Menu Function Reset).

From the front of the unit, press the two outside keys (left arrow and EXEcute) at the same time and hold for two seconds, as shown in the following diagram. The unit will go into self-test.

Note: Time and date are lost during a hardware reset, current configuration remains.

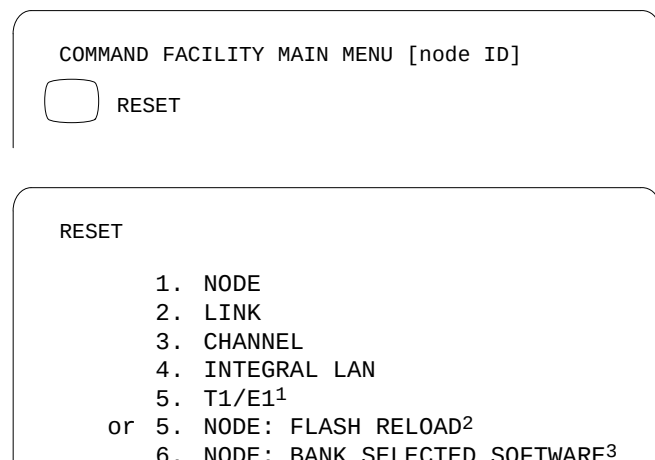
Simultaneously push both outside keys and hold for 2 seconds.
Backlight will momentarily extinguish



Hardware Reset with LCD/Keypad

Command Facility Reset

In the Command Facility, several types of software resets are available. To access the Reset menu, follow this path:



¹ Only displays on NetRunner 500ET and 2000E,ED units.

² NetRunner 75E if only single-bank Flash memory.

³ Displays for units with dual-bank Flash memory.

The following options are available.

Option	Description
1. Node	For the local node only. All locally attached MICOM muxes will reset. Remote unit(s) and their MICOM muxes will not be reset by this option. Two options for node reset are factory <i>default values</i> (cold start), or <i>current configuration</i> (warm start). Notes: • If you are attempting to activate new software or a FlashPak, you must use the Node: Flash Reload option. This option uses the current version of software. • The T1/E1 Access Module will not reset with this option. You must select the T1/E1 option for that reset (NetRunner 500ET and 2000E,ED units).
2. Link	Clears all information on the link and <i>will disconnect all ports</i> currently using the link being reset. <i>If a mux link</i>, it will reset the MICOM mux also. Force connected channels will automatically reestablish connection. Refer to Link Reset on page 4-30 for frame relay link information.
3. Channel	Disconnects and resets a <i>single data or voice/fax channel only</i> without disturbing the whole network.
4. Integral LAN	Resets the integral LAN module (IRM).
5. or 6. (option number varies depending on unit)	
• T1/E1	Resets the T1 or E1 Access Module on the NetRunner 500ET or 2000E,ED. All traffic on the T1 or E1 access module and associated Digital Voice Modules will be interrupted. The unit will not reset.
• Node: Flash Re-load	NetRunner 75E with single-bank Flash memory. Loads the software from the Flash bank into RAM. This reset takes several minutes to complete.
• Node: Bank Selected Software	If you have a dual-bank Flash memory installed and have proceeded through all the steps to download and select a bank, this option resets the node and loads the selected bank into RAM. This reset takes several minutes to complete.

Downloading Code

If your unit is equipped with a FlashPak cartridge or if it contains internal flash memory, you may download new software (code) to your unit. Also, your voice module (Release 4.0 and later), Integration Router Module (LAN IRM Release 6.0 and later), the T1/E1 Access Module (Release 4.3 and later) and Digital Voice Module (Release 4.3 and later) are code downloadable. The complete procedures for downloading code are found in the Code Download User's Manual (Part No. 800-1844).

\$DLD Facility

The \$DLD download facility interfaces between the NetRunner unit and the device actually performing the code download (PC or NETMan). To protect against unauthorized access to this facility, you may set a password. There is a timer associated with the facility (\$DLD Activity Timeout); if there is no activity in the facility during the specified time, it will disconnect. The default for this timeout is 120 seconds. To set a password or establish a timeout period other than the default, use the following path:

Option number varies,
depending upon model.

COMMAND FACILITY MAIN MENU

☐ 3 CONFIGURE LOCAL NODES

CONFIGURE LOCAL NODES

☐ DOWNLOAD PARAMETERS

DOWNLOAD PARAMETERS

☐ 1 \$DLD PASSWORD

☐ 2 \$DLD ACTIVITY TIMEOUT (SECONDS)

If you select password, this prompt will display. Refer to page 7-1 for the password syntax information.

ENTER \$DLD PASSWORD:

If you select timeout, this prompt will display. Select the time in seconds (30-240).

ENTER ACTIVITY TIMEOUT 30-240 (^X TO ABORT) (current value):

Activating Downloaded Code

In the dual bank internal Flash memory or FlashPak, you may select which bank to activate (load into RAM); this is assuming that both banks contain code. It is likely that you will want to use the most recent version. Use the following path for activating the most recent code.

Note: This procedure is only for FlashPak and units with dual-bank memory.

Access the Download Parameters menu.

COMMAND FACILITY MAIN MENU
☒ 3 CONFIGURE LOCAL NOES

Option number may vary, depending upon model.

CONFIGURE LOCAL NODES
☐ DOWNLOAD PARAMETERS

DOWNLOAD PARAMETERS
☐ CCM BANK TO ACTIVATE WITH RESET

Select the bank to activate.

CCM BANK TO ACTIVATE WITH RESET
☒ 3 MOST RECENT

Return to Main Menu.

DOWNLOAD PARAMETERS
 ENTRY: M

Reset the unit.

COMMAND FACILITY MAIN MENU
☒ 10 RESET

Option numbers may vary.

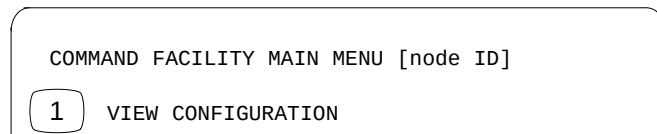
RESET
☐ NODE: BANK SELECTED SOFTWARE

Note: If you elect to load a previous version of software, you will have to reset your unit to the factory default.

View Configuration

View configuration is a display of the existing configuration. It is occasionally helpful to verify changes in configuration and information gathering during troubleshooting. No changes to the configuration can be effected through these menus.

This menu is accessed from the Command Facility Main Menu.



The following options are available:

Option	Description
1. Async Channels	Displays a range of async ports.
2. Sync Channels	Displays a range of sync ports.
3. Voice/Fax Channels	Displays a range of voice/fax ports.
4. Classes	Displays the class parameters as currently configured.
5. Class Messages	Displays the current class messages for all the configured classes.
6. Dialog Messages	Displays all of the dialog messages.
7. Hardware	Displays the installed modules, their model number and revision level.
8. External Modem Phone #	Displays the telephone number used by an external modem to output events and alarms (if an external modem is configured).

Options 1-6 display the configuration of the local unit and the local MICOM muxes. Options 7 and 8 display the local unit's configuration only. To view the remote NetRunner unit(s) configurations, connect to the remote Command Facility via the Configure/View Remote Node option (on the Command Facility Main Menu).

Status/Statistics

Status is a snapshot of the system as it appears the moment the request is made; statistics are a readout of the system within a defined period of time.

COMMAND FACILITY MAIN MENU [node ID]

2 STATUS/STATISTICS

The following options are available:

Option	Description
1. Node Status	Displays the current node IDs, node numbers, port and link type, link status and speed for nodes connected directly to the local NetRunner unit. It also lists all available nodes in the network.
2. Channel Status	Displays the current voice/fax and data channel status of a range of ports, the speed, and the node ID/channel number of any connection.
3. Interface Status	Displays the current interface state of the control signals for the selected port (local NetRunner unit only).
4. Queue Status	Lists all the class numbers, names and the node ID/channel number of the ports queued to each class. This will display up to 30 ports per class.
5. Voice/Fax Status	Displays a range of ports selected, the input level, the mode (on hook, off hook, busy), the software revision, and if applicable, the test mode, test status, and Flash status.
6. System Statistics	Provides two options, the period report (the report compiled during the last reporting period) or a demand report (statistics since the last report).
7. Channel Statistics	Displays the current channel statistics for the node selected. Displayed are percentage of buffer utilization, busyout and flow control status. Integral devices are not displayed with this menu.
8. Switch Statistics	Displays by class number, the name, the number of connects, connect failures and maximum number of ports in queue.
9. PROM ID	Displays the PROM set number of the NetRunner FEATUREPAK or FlashPak cartridge. The last character in the number reflects the revision level. On units utilizing Flash memory (FlashPak or on-board), this option displays the status of each bank and the boot code.
10. Voice/Fax Daily Statistics	Displays current statistics accumulated since midnight.
11. NETMan Status	Displays a current status of the optional network management system (if installed).

System Statistics Reports

There are two types of reports, a demand report (a snapshot of the system at the time of request) or a period report. The information in the period report is based on a configured period of time. These reports can be output regularly to a configured destination (local command port, log port, or remote node). Both appear in the same screen format.

The first screenshot shows the 'COMMAND FACILITY MAIN MENU [node ID]' with a box around the number '2' next to the 'STATUS/STATISTICS' option.

The second screenshot shows the 'STATUS/STATISTICS [node ID]' screen with a box around the 'SYSTEM STATISTICS' option.

The third screenshot shows the 'SYSTEM STATISTICS' screen with a numbered list: '1. LAST PERIOD REPORT' and '2. DEMAND REPORT'.

Samples of reports can be found in the optional Command Facility Reference Guide.

Channel Administration

Occasionally a data or voice/fax port must be removed from service, reset, reconfigured, or returned to service. For instance, a port may need to be removed from service so that periodic maintenance may be done on the attached device.

To reset a channel, refer to page 7-4.

Disable or Enable a Channel

COMMAND FACILITY MAIN MENU [node ID]

5

SWITCHING CONTROL

SWITCHING CONTROL

1

ENABLE CHANNEL

2

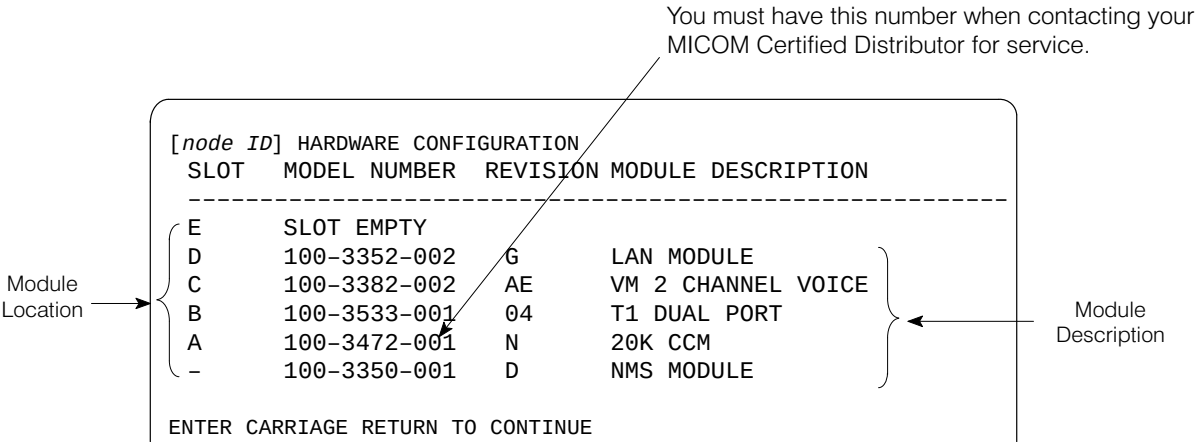
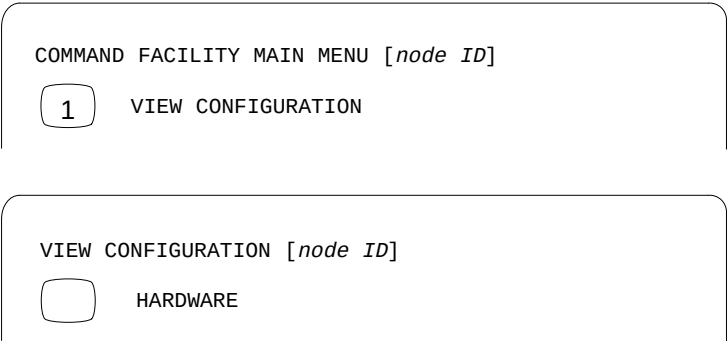
DISABLE CHANNEL

Option	Description
1. Disable Channel	Takes an async data or voice/fax port out-of-service.
2. Enable Channel	Places the async data or voice/fax port back into service.

Options 3-4 of this menu do not apply to this application.

Determining What Hardware You Have

Follow this path when you need to determine the exact information on your hardware.



Worksheets A

This section contains worksheets to help organize and keep a record of your network and of your async and sync channel configurations. Copy these sheets as many times as necessary. Keep a completed copy of these sheets near the NetRunner unit; be aware that page A-18 is a Passwords Worksheet.

The following worksheets are provided:	Page
Ethernet Address	A-1
Worksheet for Planning Node Numbers and Node IDs ..	A-2, A-3, A-4
Record of Cluster Names	A-4, A-5
Port Configuration Worksheet	A-5
Secondary Interconnect Link Worksheet	A-6
Utilization Thresholds	A-6
Frame Relay Worksheet	A-7
DLCI Parameters	A-7
Frame Relay Link Parameters	A-8
Local Management Control	A-8
Sync Protocol and Channel Worksheet	A-9
Async Channel Characteristics Worksheet	A-11
Async Channel Features Worksheet	A-13
Async Channel Switching Configuration Worksheet	A-15
Async Channel Extended Features Worksheet	A-17
Async Classes Worksheet	A-18
Command Facility Parameters Worksheet	A-19
Dialog Messages Worksheet	A-20
Record of Passwords Worksheet	A-21

Ethernet Address (also called hardware address)

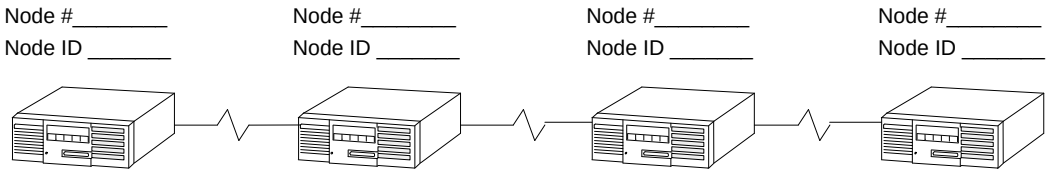
(written on a label on the back of the Integration Router, or for the NetRunner 75E, on the back of the LAN/WAN module)

6-byte value, in hexadecimal

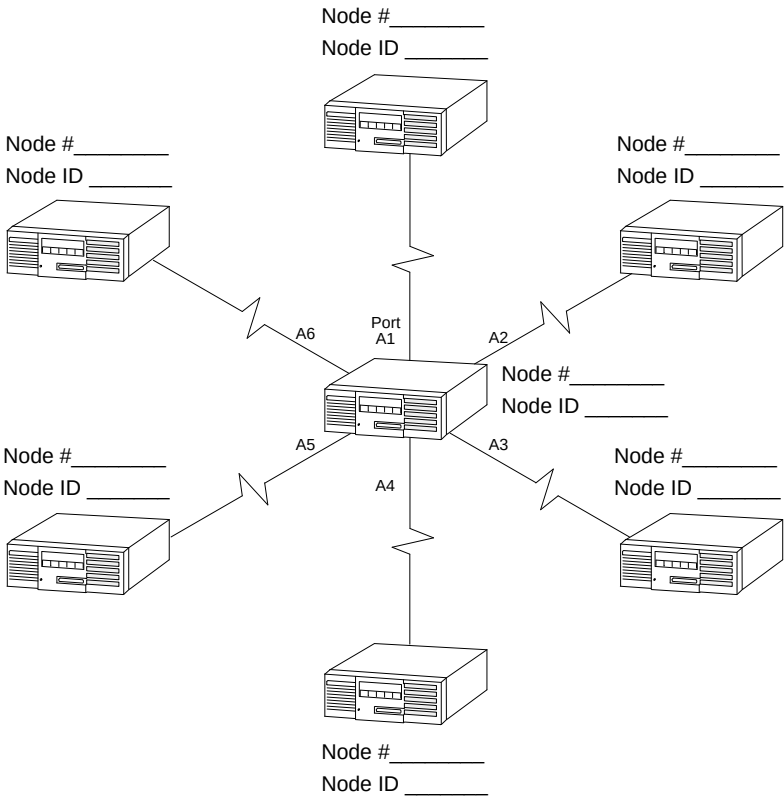
MICOM's hardware addresses are

00-40-C5-xx-xx-xx, where x = 0-9 or A-F

 00 - 40 - C5 - - -

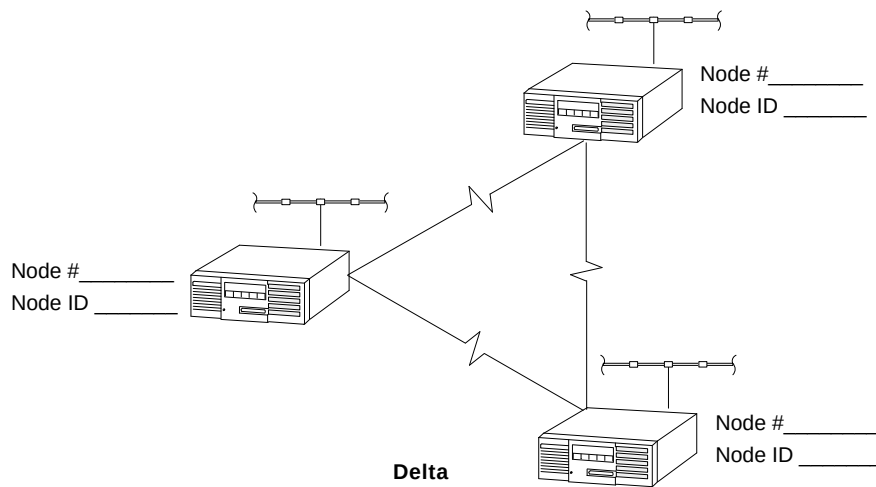
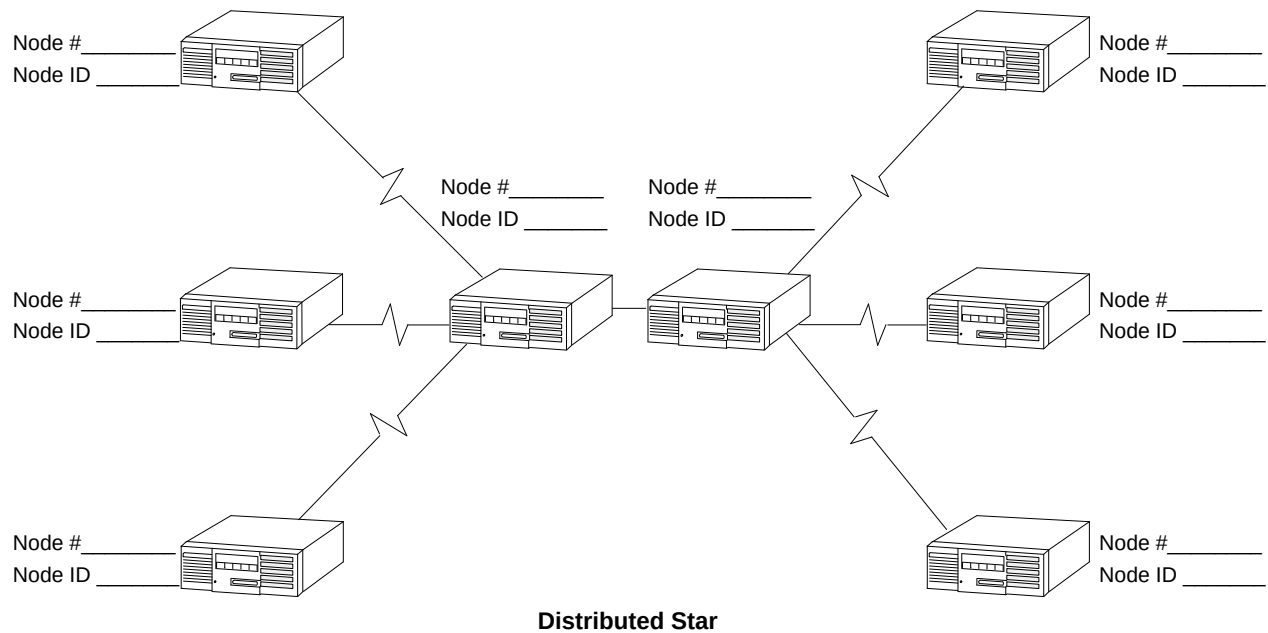


String Topology

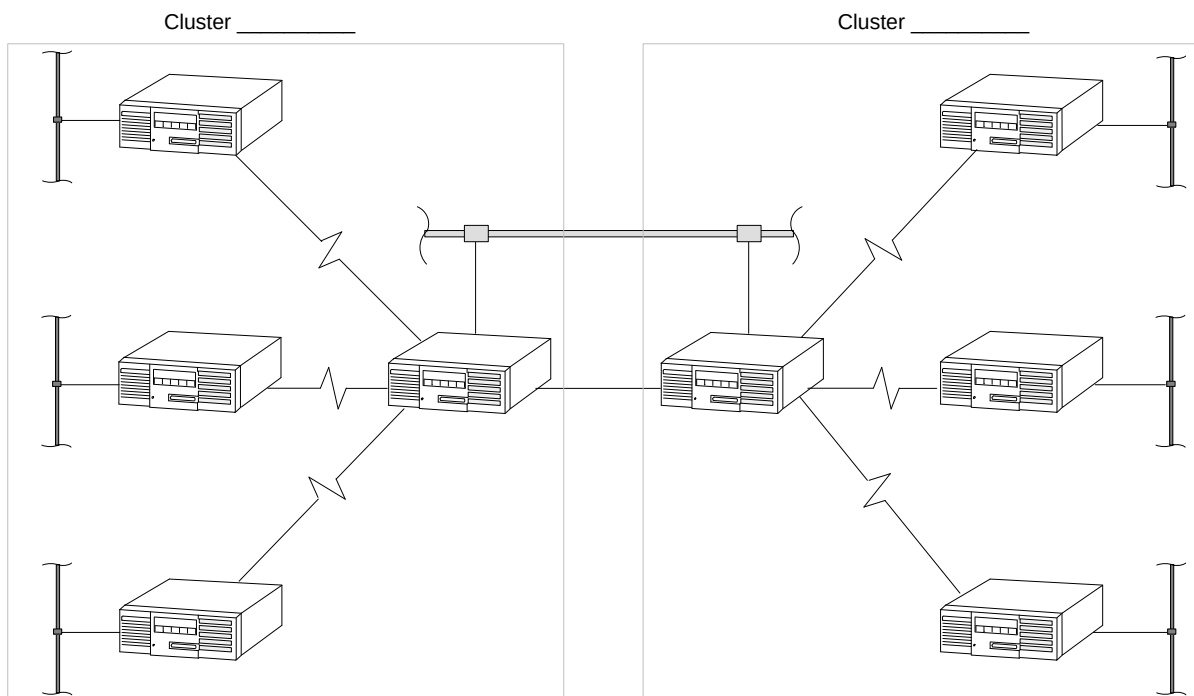
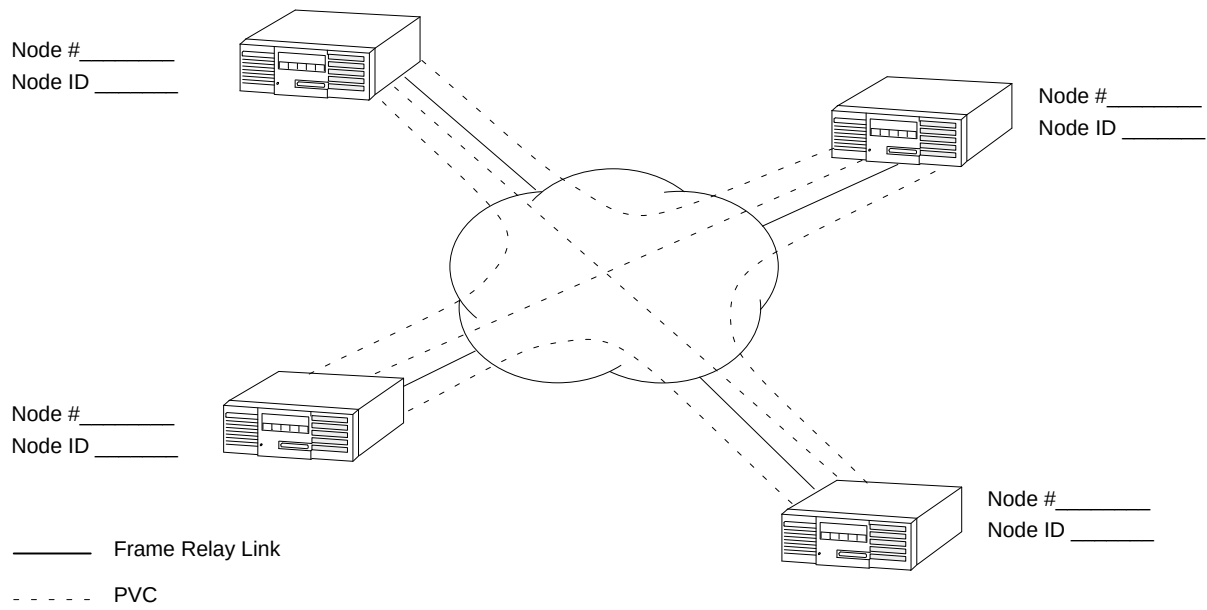


Star Topology

Worksheet for Planning Node Numbers and Node IDs



Worksheet for Planning Node Numbers and Node IDs (continued)



**Worksheet for Planning Node Numbers and Node IDs (continued)
and Cluster Names**

Record of Cluster Names

Cluster Name	NetRunner	
	Node Number	Node ID

Port Configuration Worksheet

Port	Type	Link Rate/Sync Protocol

Secondary Interconnect Link Worksheet

Port	Type (Secondary/Pri- mary)	Associated Link	Connected to Node/Port	Control Parameters	
				Terminated Switched Voice Calls	Forced On

Utilization Thresholds

Secondary On Threshold %	On Threshold Time Length (minutes)	Secondary Off Threshold %	Off Threshold Time Length (minutes)	Backup Only

Frame Relay Worksheet

Node ID (name)

Port No.

DLCI Parameters

DLCI	Level 2 Protocol	Bc.Fwd	Bc.Bwd	Be.Fwd	Be.Bwd	CIR.Fwd	CIR.Bwd

Frame Relay Link Parameters

Node ID (name)

Port	Clock Speed	Port Clocking	Maximum Frame Size	Network Address	Local Management

Local Management Protocol Parameters (Annex D or LMI Rev 1 Parameters)

Port	Full Status Polling Counter (N391) (nN1)	Error Threshold (N392) (nN2)	Monitored Events Count (N393) (nN3)	Link Integrity Verification Timer (T391) (nT1)	Polling Verification Timer (T392) (nT2)	Access Link Mode

Sync Protocol and Channel Worksheet

Node ID (name)

Channel No.	Protocol	Data Rate	Channel Clocking	Maximum Transmit Block Size	Maximum Receive Block Size	Interface Type

Channel No.	Carrier Mode	Sync Char. ¹ 1 : 2	# of Leading Syncs	Pad Char.	# of Leading Pad Chars.	# of Trailing Pad Chars.

¹ It is very important that the current sync character be configured; otherwise false syncing may occur.

Sync Protocol and Channel Worksheet (continued)

Node ID (name) (cont'd)

--

Channel No.	Encoding	Idle Fill	Buffer Control	Clock Flow Control	DSR Control	Priority	Sync Claimed Bandwidth

Channel No.	Force Connected to Node Id/Channel No.

Async Channel Characteristics Worksheet

Node ID (name)

Channel No.	Data Rate	Code Level ¹	Parity ¹	Stop Bits	Echo	To Host/ To Terminal

¹ These must be set to match the attached equipment.

Async Channel Characteristics Worksheet (continued)

Node ID (name) (cont'd)

Channel No.	XON Char.	XOFF Char.	Buffer Ctrl	Flow Ctrl	CR Delay	LF Delay	FF Delay

Async Channel Features Worksheet

Node ID (name)

Channel No.	Priority	EIA Ctrl	Smooth Scroll	Tandem	Flow Ctrl Strip	HP ENQ/ACK

Async Channel Features Worksheet (continued)

Node ID (name) (cont'd)

Channel No.	Sync Loss Disconnect	Command Mode Entry Sequence	Command Mode Access	Command Facility Main Menu Access	Local Channel Configuration

Async Channel Switching Configuration Worksheet

Node ID (name)

Channel No.	Connect Protocol	Unbalanced Rate	Call Inhibit	Receive Inhibit	Character Set	Matrix Switch

Async Channel Switching Configuration Worksheet (continued)

Node ID (name)

Channel No.	Resource Class	Destination Node/Class	Channel Password	If Force Connected, Node ID/Channel No.

Async Channel Extended Features Worksheet

Node ID (name)

Channel No.	Data Compression	Remote CTS Control

Async Classes Worksheet

Node ID (name)

Class #	Class Name	Secondary Class	Class Password	Class Message	Class No Activity Timeout	Ports Assigned to Class

Command Facility Parameters Worksheet

Node ID (name)

Option	Entry
Time	—
Date	—
Event Reporting	
Alarm Reporting	
Switch Statistics Reporting	
Periodic Reporting Interval	
Output Event/Alarm Reports	
Output Periodic Reports	
Remote Node ID	
External Modem Priority	
External Modem Phone #	
External Alarm Relay	
No Activity Timeout	
LCD Banner Message ¹	
Day of the Week	

¹ Not applicable to NetRunner 75E.

Dialog Messages Worksheet

Node ID (name)

Option	Entry
Channel Password	
Welcome	
Class Request	
Class Password	
Connected	
Queue	
Busy	
Disconnected	
No Answer	
Unavailable	
Unassigned	
Incompatible	
Call in Progress	

Record of Passwords Worksheet

Node ID (name)

--

Option	Entry
Global	
Status	
LCD/Keypad	
NETMan (\$PPP)	
Code Download (\$DLD)	

Class Number	Class Name	Class Password

Node Id	Channel Number	User Channel Password

Server	Incoming Password	
	Login Password	
	Maintenance Password	
	Privileged Password	

Messages B

The messages contained in this appendix include those messages received from the optional modules.

	Page
Screen Display Messages	B-2
LCD/Keypad Messages	B-16

Note: The STADIA Integration Hub does not offer an LCD Keypad.

Message Type:

Alarm	Vital to the system's operation; may cause an interruption to that operation.
Event	Occurs in the regular operation of the system; most likely will not affect the system's operation.
Dialog	Configurable async user messages.
Diag	Diagnostic messages.
Info	Informational.

Key:

VF	=	Voice Frequency.
ADB	=	Automatic Dial Backup.
<>	=	Brackets indicate configurable messages. Default is shown.
<i>cl</i>	=	Class name, voice/fax extension number, or MATRIX (if matrix switching is used).
<i>ci</i>	=	Channel (port) number. In the case of frame relay ports, the port number is followed by a decimal point and the four-digit number of the local DLCI (the DLCI attached to the local unit).
<i>ds</i>	=	T1 Line interface either DS-1 or DSX-1
<i>li</i>	=	E1 Line interface either L1 or L2
<i>n/c</i>	=	Node ID (n)/channel number (c). ¹
<i>ni</i>	=	Node ID.
<i>nn</i>	=	A variable amount.
<i>ml</i>	=	Module location letter [B-E].

¹ In some cases the channel number will display the following:

CMD	=	Command Facility
PPP	=	NETMan connection
PPPn	=	One of the NETMan secondary channels (n could be 1-5)

Table B-1. Screen Display Messages

Message	Message Type	Explanation
<i>ni [ml]</i> ADDING CHECKSUMS.	Info	The Integration Router Module is performing checksums on the new code which has just been downloaded.
<i>ni (li or ds)</i> ALARM INDICATION SIGNAL CLEARED	Alarm	The ALARM-indication-signal has cleared—the T1 or E1 line is available. The ones condition previously detected is clear.
<i>ni (li or ds)</i> ALARM INDICATION SIGNAL DETECT	Alarm	This indicates that T1 or E1 line is unavailable. All ones condition exists for 100 milliseconds or longer.
ANSWER & FORCE CONNECT ARE INCOMPATIBLE	Info	You have attempted to force connect a secondary link at the answer side of the link. You must force connect the link at the originate side of the link.
APPLICABLE TO RTS FUNCTIONALITY ONLY	Info	In trying to configure an integral LAN module, you have selected a module location which does not support RTS functionality. (Most likely there is a bridge installed in the module location you selected. This does not require the configure menu.)
<i>ni</i> BATTERY LOW	Alarm	Indicates the CMOS battery at node <i>ni</i> is low and a power loss could result in a cold start of the system.
<i>ni [ml]</i> BOOT <i>nnn-nnnn-nx</i>	Info	The Integration Router Module has been reset and is using the version of software indicated (<i>nnn</i>).
<i>ni</i> BUFFER OVERFLOW, CHANNEL <i>ci</i>	Alarm	Data has been lost at node <i>ni</i> , port <i>ci</i> because of an overflow condition.
<BUSY>	Dialog	Message is only sent to async channel call originators using matrix switching when the requested resource is in use by another network user.
CALL INITIATION ALARM	Alarm	Unable to connect to a MICOM mux on an X.21 link after the configured number of tries. Data in the buffers has been discarded.
<CALL IN PROGRESS>	Dialog	Indicates that an async call connection is in progress across the interconnect link.
<i>ni [ml]</i> CCM BAD CHECKSUM.	Event	The Integration Router Module code download file was not received correctly due to one of the following reasons: • Wrong image file • Corrupted file • Incomplete transmission

Table B-1. Screen Display Messages (continued)

Message	Message Type	Explanation
<i>ni [ml]</i> CCM HEADER FAIL.	Event	The header portion of the Integration Router Module code download file was not received correctly.
<i>ni [ml]</i> CCM DOWNLOADING	Info	Code download to the Integration Router Module is in progress.
<i>ni [ml]</i> CCM LOAD WAITING	Info	The Integration Router Module is ready for code download via a CCM async port.
<i>ni [ml]</i> CCM LOAD SUCCESS.	Info	The code download to the Integration Router Module is completed.
<i>ni</i> CD ACQUIRE <i>ci</i>	Event	Indicates carrier has been detected on the mux or interconnect link indicated by <i>ci</i> .
<i>ni</i> CD LOSS <i>ci</i>	Alarm	Indicates carrier loss on link <i>ci</i> .
<i>ni</i> CD LOSS LINK <i>ci</i>	Alarm	Communications has been lost between the local unit and the frame relay switch.
CHANNEL CURRENTLY CONFIGURED AS PRIMARY	Info	Port is configured as a primary link. Before you can configure this port as other than an interconnect link, you must deassign it from the secondary link. (Go into Port Configuration and start as if configuring the secondary link and answer no at the primary link prompt.)
CHANNEL <i>ci</i> CURRENTLY USING COMMAND FACILITY	Info	Command Facility Main Menu functions are already being used by the port indicated (<i>ci</i>).
CHANNEL INOPERABLE	Info	You have requested channel status for a voice or fax port that is non operational.
CHANNEL NOT CONNECTED, IN QUEUE OR INHIBITED	Info	Attempt has been made to force disconnect to one of the following: • A port already disconnected • An inhibited port such as a link.
CHANNEL NOT INSTALLED	Info	Attempt has been made to configure or test a voice/fax port. However the port number selected is not a voice/fax port.
CHANNEL(S) NOT INSTALLED	Info	Attempt has been made to view the status or configuration of a range of ports that are not voice ports.
CHANNEL REQUEST UNSUCCESSFUL, PLEASE RETRY	Info	Voice/fax port you are trying to test is not working properly.
CHECK CONFIGURATION	Info	Your unit has lost a configuration update due to a power loss. Check your configuration, it may have reverted to earlier configuration values.

Table B-1. Screen Display Messages (continued)

Message	Message Type	Explanation
CHECK FOR PROPER DEVICE INSTALLATION	Info	Selection entered required either an integral ISU, T1, E1 or LAN module. You may have entered the wrong number.
<i>ni</i> CMOS ERROR	Alarm	Problem detected in writing to the configuration area. Contact your Certified MICOM Distributor.
COMMAND FACILITY DISABLED	Info	Command Facility Main Menu cannot be accessed by the port requesting it.
COMMAND INHIBITED BY PASSWORD	Info	Password entered does not permit access to the selected menu. (Password is status type rather than global type and permits access only to view, status and disconnect functions.)
COMMAND MODE PORTS BUSY	Info	All available ports to the Command Mode are busy. Up to two ports and the dedicated Command Port (on the NMS module) may access the Command Mode at one time.
CONFIGURATION INHIBITED WRONG CHANNEL TYPE	Info	Async or sync port configuration is being attempted, but the channel number selected is for a port of a different channel type.
CONFLICT IN CHANNEL TYPES	Info	Attempt has been made to copy channel parameters of two dissimilar channel types.
CONNECT <i>n/c n/c cl</i>	Event	Indicates the pair of ports that have been connected and the called port's class or extension number (in the case of voice/fax ports). Also indicates a force connect has been made.
CONNECT FAIL	Info	Unable to connect to the remote Command Facility from the local Command Facility.
CONNECT FAIL MATRIX <i>n/c</i>	Event	Matrix connection request made by the local port did not complete successfully. Also, password may be incorrect.
<CONNECTED>	Dialog	Message is sent to the async user when a connection has been established across the link (L or H may appear at the end if there are unbalanced rates). L = you are connected to a lower speed device H = you are connected to a higher speed device
DATA LOSS	Info	X.21 bis network is unable to synchronize across the link. Your data is lost.
DATE <i>nn/nn/nn</i>	Event	Appears on each new day and any time the date is configured.

Table B-1. Screen Display Messages (continued)

Message	Message Type	Explanation
<i>ni</i> DDS IN SERVICE LINK <i>ci</i>	Event	ISU at node <i>ni</i> has returned to service for link <i>ci</i> .
<i>ni</i> DDS OUT OF SERVICE LINK <i>ci</i>	Event	ISU at node <i>ni</i> is out of service for link <i>ci</i> .
<i>ni</i> DDS RUNNING LOOP TEST LINK <i>ci</i>	Event	A loop test is being run on the ISU at node <i>ni</i> for link <i>ci</i> .
<i>ni</i> [<i>ml</i>] \$DLD CONNECTED.	Info	The Integration Router Module is connected to the download facility and is ready for code download.
DISABLED	Info	Function is disabled.
<DISCONNECTED>	Dialog	Connection has been broken. Sent to call originator only when switching is used (not for forced connections).
DISCONNECT <i>n/c n/c</i>	Event	A pair of ports has been disconnected.
<i>ni</i> DLCI ACTIVE <i>ci</i>	Event	The specified DLCI on the link has become active.
<i>ci</i> DLCI ALREADY PRESENT	Info	You are attempting to add an existing DLCI.
<i>ni</i> DLCI DELETED <i>ci</i>	Alarm	The locally attached frame relay switch has reported to the local unit that the DLCI has been deleted.
<i>ni</i> DLCI INACTIVE <i>ci</i>	Alarm	The locally attached frame relay switch has reported to the local unit that the DLCI is inactive.
<i>ci</i> DLCI NOT ADDED, INSUF RESOURCE	Info	There is insufficient processor memory to add the requested DLCI.
<i>ni</i> [<i>ml</i>] DONE	Info	The Integration Router Module has erased its Flash memory in preparation for code download.
DOWNLOAD COMPLETE	Info	The download process is now complete.
DOWNLOAD IN PROGRESS – CAN NOT CONFIGURE	Info	You have attempted to configure a port which is in the process of downloading code. Try again later.
DOWNLOADING FILE CHECKSUM ERROR	Info	An error was recorded during the download process. Try again.
DOWNLOAD IN PROGRESS, TRY LATER	Info	You have attempted to configure, to run diagnostics, or to reset a port or node that is currently downloading code. Try again later.

Table B-1. Screen Display Messages (continued)

Message	Message Type	Explanation
<i>ni</i> DUPLICATE NODE-ID <i>ci</i>	Info	- Two nodes in the network have the same ID. - There is a closed loop in a non-mesh network (unit).
<ENTER CLASS>	Dialog	Asks the user for the destination class name.
<ENTER CLASS PASSWORD>	Dialog	Asks the user for the password associated with the destination port's class. If no password is configured for the class, the user should press <cr>.
<ENTER PASSWORD>	Dialog	Asks for a password associated with the signed on port.
ERASE ABORT	Info	The erasing process of the Flash memory has been aborted.
ERASE COMPLETE	Info	Flash memory has been erased.
<i>ni [ml]</i> ERASING FLASH. . .	Info	The Integration Router Module is erasing its Flash memory in preparation for code download.
ERROR: INVALID CHECKSUM IN FILE!	Alarm	The download code has an error, try again.
<i>ni [ml]</i> FILE HEADER READ FAILED.	Event	The header data received for the code download file was not correct for the Integration Router Module.
<i>ni [ml]</i> FILE LOADED FAILED, <i>nnnnnn</i> BYTES LOADED	Event	The Integration Router Module code download data transfer started but did not successfully complete. The number of bytes actually transferred is <i>nnnnnn</i> .
FLASH WRITE ERROR	Event	An error has occurred while attempting to download code to a Flash memory. Verify that receiving Flash memory is erased before making another attempt.
FORCE CONNECT: PRIMARY NOT ASSIGNED	Info	You have attempted to force connect a secondary link which has no primary link assigned. Return to the Port Configuration Menu and assign a primary link to this secondary link before continuing.
FOX TEST ACTIVE	Diag	Async channel output test has been activated.
ILLEGAL INPUT	Info	Entry, as received, cannot be executed. Could be caused by an incorrect password or an incorrect broadcast message.
ILLEGAL SELECTION	Info	Number entered is not on the list of items of the displayed menu.

Table B-1. Screen Display Messages (continued)

Message	Message Type	Explanation
<INCOMPATIBLE>	Dialog	Attempted connection is not compatible with the configuration.
INCOMPATIBLE LINK TYPES	Info	You are trying to connect a mux link to the port configured as an interconnect link or vice versa.
INCORRECT CHANNEL TYPE	Info	Port selected for the test desired is of the wrong type or an attempt has been made to broadcast to one of the following: • A link port • An out of service (OOS) port • A voice port
INPUT FILE RECEIVED. RESET	Info	The download code was received correctly. The system automatically resets showing the boot ID and \$DLD prompt.
INHIBITED	Info	MICOM mux connected to the Command Facility tried to activate a remote composite loopback on the link.
INPUT REQUIRED	Info	<cr> without a data entry was received for a function which requires a data input, such as entering a channel number, or a new password.
INPUT TEST ACTIVE	Diag	Async output test has been activated.
INTEGRAL DEVICE NOT INSTALLED	Info	No integral device has been installed in the module location you specified.
INTEGRAL VIEW CONFIGURATION NOT SUPPORTED	Info	You attempted to view the configuration parameters of an Integral ISU. There is no view for an ISU.
INVALID DATA	Info	One of four possibilities has occurred: • The remote node ID was entered for a channel statistics request. • There was an attempt to enable/disable a link. • A remote node ID was entered for port configuration. • The entered value is invalid or you have used the improper syntax.
INVALID DESTINATION STRING	Info	You have attempted to force connect to an unknown node.
INVALID DOWNLOAD FILE	Event	The file you have attempted to download is invalid; check the file name.

Table B-1. Screen Display Messages (continued)

Message	Message Type	Explanation
INVALID ENTRY	Info	- A port other than A1 or A2 was entered when a request was made for status or configuration of an integral device. - You have attempted to duplicate a class which has already been defined.
INVALID FILE CHECKSUM	Event	An error has occurred during code download. Try again.
INVALID FLASH PLEASE DOWNLOAD	Alarm	You are attempting to access a T1 module whose Flash memory has been erased. Perform a code download and try again.
INVALID NUMBER	Info	- The prompt requires a numeric input. - In configuring a voice or fax extension number, you have entered fewer or more than the required number of digits.
INVALID OR UNKNOWN DLCI [number input]	Info	You have attempted to delete, configure, or reset a DLCI that is unknown or invalid. Try again with valid DLCI.
IS SECONDARY LINK; MUST REMOVE PRIMARY LINK	Info	Port is configured as a secondary interconnect link. Before you can configure this port as other than a secondary interconnect link, you must deassign it from the primary interconnect link. (Answer <i>NO</i> at the primary link prompt.)
ISU DIGITAL LOOPBACK ACTIVE LINK # <i>ci</i>	Diag	ISU on link <i>ci</i> has been placed in digital loopback.
ISU LOCAL LOOPBACK ACTIVE LINK # <i>ci</i>	Diag	ISU on link <i>ci</i> has been placed in local loopback.
ISU LOCAL LOOPBACK WITH TP ACTIVE LINK # <i>ci</i>	Diag	This test places the local ISU on link <i>ci</i> in loopback, then verifies the operation of the ISU by sending and receiving the test pattern.
ISU TEST PATTERN ACTIVE LINK # <i>ci</i>	Diag	Test pattern generator on the ISU on link <i>ci</i> has been activated.
ISU TEST TERMINATED LINK # <i>ci</i>	Diag	Test for the ISU on link <i>ci</i> has been terminated.
<i>ni</i> LAN MODULE LOCATION [<i>m</i>] DOWN	Info	LAN module in <i>m</i> is not available for use.
<i>ni</i> LAN MODULE LOCATION [<i>m</i>] UP	Info	LAN module in <i>m</i> is operating and available.
LAN RESET: BAD COMMAND LENGTH	Alarm	The length of the message being received is too long. Verify the proper operation of your LAN module.
LAN RESET: NO ACTIVITY T/O	Event	LAN module is non-responsive and is resetting.

Table B-1. Screen Display Messages (continued)

Message	Message Type	Explanation
LAN RESET: VIA COMMAND FACILITY	Event	A LAN module reset has been initiated at the Command Facility.
LAN RESET: VIA LAN MODULE	Event	A user on the LAN side has initiated a LAN module reset.
LAN RESET: LAN->LAN RELOAD	Info	The Integration Router Module is resetting in preparation for code download via the LAN (from a Bootp/TFTP server).
LAN RESET: WAN->LAN RELOAD	Info	The Integration Router Module is resetting in preparation for code download via a CCM async port.
<i>ni</i> LINE ALARM <i>ci</i>	Alarm	Link <i>ci</i> at node <i>ni</i> has a line alarm, indicating a high line error rate.
<i>ni</i> LINE ALARM LINK <i>ci</i>	Alarm	<i>If only port number displays:</i> Excessive line error rate between the local unit and the attached frame relay switch. <i>If the port and DLCI number displays:</i> Information between the units using <i>ci</i> is being lost. Does not apply to information sent in excess of the configured committed information rate (CIR) or burst sizes (Bc, Be). Possible causes, • CRC error • Frame relay discard due to congestion
LINK DOWN <i>ci</i>	Alarm	Local unit has timed out (40 seconds) waiting for sync to be acquired on link <i>ci</i> . Check the cabling, modem and remote unit for errors.
LINK RATES RESTRICTED TO 19.2 KBPS OR LESS	Info	You have attempted to configure a data rate higher than 19.2 Kbps on port A3 of the NetRunner 500ET. This is not permitted; select a lower rate.
LOCAL CHANNEL CONFIGURATION DISABLED	Info	Local Channel Configuration menu cannot be accessed by the async port requesting it.
LOCAL FOX	Diag	Port has been placed into a local fox loopback test.
<i>ni</i> LOCAL LINK RESTART <i>ci</i>	Event	• Node <i>ni</i> on link <i>ci</i> has been restarted. • Local node <i>ni</i> initiated a reset of the DLCI using the reported <i>ci</i>.
<i>ni</i> LOCAL SYSTEM RESET	Alarm	Local unit has been reset.
LOCAL TEST, ECHO INPUT	Diag	Port has been placed into a local echo loopback test.
LOCKED PARAMETER	Event	This parameter is locked out by the hardware configuration.

Table B-1. Screen Display Messages (continued)

Message	Message Type	Explanation
LOGGING REPORT, TRY LATER	Event	Command Facility status/statistics functions are not available because periodic report is being output.
MAXIMUM DLCI'S ALREADY IN USE	Info	You are attempting to add a DLCI to a system already using the maximum number of DLCIs. Either delete a DLCI or do not attempt to add another one.
MODULE NOT OPERATIONAL	Info	LAN module is installed but not operational.
<NO ANSWER>	Dialog	Indicates that no answer was received from the async destination port. Causes include the following: • Remote port did not respond to connection protocol. • No response was received within the call time out period from the remote unit, although the ports are known by the local unit. • Call inhibit is enabled (<i>on</i>). • DTR = <i>low</i> = OOS.
<i>ni</i> NEW DLCI <i>ci</i>	Event	The unit has recognized a new DLCI on the frame relay interface.
<i>ni</i> NO ANSWER LINK <i>ci</i>	Event	The calling process has discontinued due to the absence of an answer tone on a local dial line.
NO ASYNC CHANNELS WITHIN RANGE	Info	A link port in the range selected is not configured for async.
<i>ni [ml]</i> NO BOOTP REPLY	Event	There was no response to the Integration Router Module's Bootp request broadcast for code download.
NODE-CHANNEL NOT AVAILABLE ENTER CARRIAGE RETURN TO CONTINUE	Info	A link port number was entered when a sync, async, or voice/fax channel number was required.
NODE ID ALREADY IN USE	Info	You are trying to configure a node ID which has already been assigned in the network.
NODE NUMBER ALREADY IN USE	Info	You are trying to configure a node number which has already been assigned in the network.
NO REMOTE CONNECT ACTIVE	Info	User is attempting a remote echo/fox test from Command Mode with no connection made.
NO SYNC CHANNELS WITHIN RANGE	Info	A port or ports in the range selected are not configured for sync.

Table B-1. Screen Display Messages (continued)

Message	Message Type	Explanation
NOT ALLOWED	Event	An invalid mode of operation has been entered; it will not be supported.
NOT CONNECTED	Info	The link reported is not connected. If the link is frame relay, the DLCI reported is not connected.
NOT INTERCONNECT LINK	Info	You are attempting to attach a primary link to a secondary link and the primary link you have selected is not an interconnect link.
NOT SUPPORTED	Info	Requested voice or fax configuration parameter selected is not supported by your voice module.
NUMERIC REQUIRED	Info	You must enter a numeric character, try again.
OPERATIONAL PROCESSOR PASS	Event	Self test complete.
<i>ni li</i> OUT OF CAS FRAME	Alarm	The multiframe alignment signal has been lost on <i>li</i> . The two sides cannot sync up; check your configuration.
<i>ni li</i> OUT OF CAS FRAME CLEARED	Alarm	The out-of-CAS-frame condition has cleared on <i>li</i> .
<i>ni li</i> OUT OF CRC FRAME	Alarm	The remote side is not receiving what it expected on <i>li</i> . The CRC multiframe alignment is wrong.
<i>ni li</i> OUT OF CRC FRAME CLEARED	Alarm	The out-of-CRC-frame condition has cleared on <i>li</i> .
OUT OF RANGE	Info	Range of numbers entered is not available in the unit.
OUTPUT DATA TEST COMPLETE	Diag	Async channel output test is complete.
PRESS BREAK TO TERMINATE TEST	Diag	To terminate a channel loopback, or channel output test, press the <break> key.
PRIMARY MUST BE DEASSIGNED	Info	You are attempting to attach a secondary interconnect link to a link that is already assigned as primary to another interconnect link.
QUEUE <i>n/c cl</i>	Event	Port <i>c</i> of node <i>n</i> has been placed in a first come, first serve queue for the next available port in the class.
<i>ni (li or ds)</i> RED ALARM	Alarm	The T1 or E1 line is not operational. Indicates that an out-of-frame condition existed for the last 100 milliseconds or longer.

Table B-1. Screen Display Messages (continued)

Message	Message Type	Explanation
<i>ni</i> (<i>li</i> or <i>ds</i>) RED ALARM CLEARED	Alarm	The red ALARM has cleared — the out-of-frame condition has been absent for 100 milliseconds or longer.
<i>ni li</i> REMOTE ALARM	Alarm	A red alarm and frame alignment signaling problems have been detected at the remote side of <i>li</i> . Check your configuration or the remote unit may require maintenance.
REMOTE FOX	Diag	Port has been placed into a remote fox loopback test.
<i>ni</i> REMOTE LINK RESTART <i>ci</i>	Event	Remote node <i>ni</i> on link <i>ci</i> has been restarted. The link (and DLCI, if applicable) noted is the local unit (not remote).
REMOTE MUX DOES NOT SUPPORT COMPRESSION	Info	You attempted to enable data compression on the remote node and either the link is down or the MICOM mux does not support compression.
<i>ni li</i> REMOTE SIGNALLING ALARM	Alarm	The remote side has detected a multiframe alignment signal frame condition on <i>li</i> . Check the configuration or the remote unit may require maintenance.
<i>ni li</i> REMOTE SIGNALLING ALARM CLEARED	Alarm	The remote-signaling-ALARM is now clear on <i>li</i> .
REMOTE TEST, ECHO INPUT	Diag	Port has been placed into a remote echo loopback test.
REPORT INHIBITED	Info	Voice/fax status report has been requested for the MICOM mux. The MICOM mux cannot be connected: • Mux is in composite loopback • Link is out of sync
RESET REQ'D	Info	You have changed the sync protocol and did not perform a reset. It is necessary to reset the node before proceeding.
<i>ni [ml]</i> REQUESTING BOOTP:	Info	The Integration Router Module has broadcast a Bootp request for code download.
<i>ni [ml]</i> REQUESTING TFTP:	Info	The Integration Router Module has broadcast a TFTP GET request for code download.
SAVING; PLEASE WAIT	Info	The unit is saving its configuration, please wait 20-30 seconds.
<i>ni</i> SECONDARY LINK CONNECT TERMINATED <i>ci</i>	Alarm	Connection of the secondary link has been terminated. Secondary link is put into standby status until again activated.

Table B-1. Screen Display Messages (continued)

Message	Message Type	Explanation
<i>ni</i> SECONDARY LINK CONNECTING <i>ci</i>	Alarm	Primary interconnect link has either failed or the secondary link has been force-connected. Secondary link is in the process of establishing a link on port <i>ci</i> .
<i>ni</i> SECONDARY LINK ESTABLISHED <i>ci</i>	Alarm	Secondary link has been established and is now operating on port <i>ci</i> until either the primary interconnect link can be restored or the secondary link is force-disconnected.
<i>ni</i> SECONDARY LINK FAILURE <i>ci</i>	Alarm	Secondary link connection was unsuccessful or the link has been disconnected. It will try to reestablish the connection.
<i>ni</i> SECONDARY RETRY EXCEEDED, RESET LINK <i>ci</i>	Alarm	Secondary link cannot establish a connection. This message indicates there have been five consecutive failures. Reset the link and try again.
SECURITY VIOLATION	Info	There has been an error during the download process. Try again.
<i>ni</i> SL TIME OUT <i>ci</i>	Info	Sync loss has occurred continuously for 40 seconds.
<i>ni</i> SYNC ACQUIRE <i>ci</i>	Event	Synchronization has been achieved with the remote unit attached on link <i>ci</i> .
SYNC CHANNEL LOOPBACK <i>n/c</i>	Diag	Synchronous port <i>c</i> on node <i>n</i> has been placed into loopback mode.
SYNC CHANNEL <i>n/c</i> STOPPED	Alarm	Synchronous port <i>c</i> on node <i>n</i> has lost its output clock, or input end of frame is missing.
<i>ni</i> SYNC LOSS LINK <i>ci</i>	Alarm	<i>If only port number displays</i> , communication between the local unit and the frame relay switch has been lost. <i>If port and DLCI number displays</i> , communication between the local and remote unit over <i>ci</i> has been lost.
<i>ni</i> SYNC LOSS TIMEOUT <i>ci</i>	Event	The local and remote units have not been able to communicate in the last 20 seconds on link <i>ci</i> .
<i>ni</i> [<i>ml</i>] TFTP ACCESS DENIED	Event	The Integration Router Module does not have permission to access the code download file on the Bootp/TFTP server.
<i>ni</i> [<i>ml</i>] TFTP BAD CHECKSUM	Event	- The code download data received by the Integration Router Module from the Bootp/TFTP server was corrupted. - There was no response to the Integration Router Module's TFTP GET request to the Bootp/TFTP server for code download.

Table B-1. Screen Display Messages (continued)

Message	Message Type	Explanation
<i>ni [ml]</i> TFTP DOWNLOADING	Info	The Integration Router Module is receiving code download data from a TFTP server.
<i>ni [ml]</i> TFTP LOAD SUCCESS	Info	The Integration Router Module code download from a TFTP server was successful.
<i>ni [ml]</i> TFTP NO SUCH FILE	Event	The file that the Integration Router Module requested to download from the Bootp/TFTP server does not exist.
THE CHANNEL MUST BE DISCONNECTED	Info	Channel type or protocol change is requested and the port is connected.
THIS CHANNEL MUST BE DISCONNECTED	Info	You are attempting to configure a secondary interconnect link and the channel is currently configured as a sync or async channel and is connected. Disconnect channel, then re-attempt port configuration.
<i>ni li</i> TS-16 AIS ALARM	Alarm	The CAS signaling is unavailable on <i>li</i> . Check your configuration.
<i>ni li</i> TS-16 AIS ALARM CLEARED	Alarm	The CAS signaling is now available on <i>li</i> .
T1/E1 CODE DOWNLOAD IS IN PROGRESS. PLEASE TRY LATER	Event	You have attempted to reset a T1 or E1 Access Module during a code download. Attempt the reset again when the download is complete.
T1/E1 MODULE IS INITIATING	Info	The T1 or E1 access module is initiating the software. You cannot access the module or erase the Flash memory until the process is complete.
<UNASSIGNED>	Dialog	- Node, class, module location, or port is unknown in the network. - Password for the class may be incorrect. - If matrix switching is disabled, this message will display when matrix switching is attempted.
<UNAVAILABLE>	Dialog	Requested resource exists, but is not in service (operational). Call inhibit may be <i>off</i> or DTR is <i>off</i> .
VOICE CHANNEL <i>[n/c]</i> [condition] BUSY OUT	Event	Voice/fax port <i>c</i> on node <i>n</i> has been put in a busyout state. [Conditions] may be: SYSTEM Where the link has experienced a sync loss, a force disable command or a force disconnect command. FORCED Where the network operator has put the channel in a busyout condition via a forced busy command.

Table B-1. Screen Display Messages (continued)

Message	Message Type	Explanation
VOICE CHANNEL [n/c] BUSYOUT CLEARED	Event	Termination of a busyout condition has occurred on voice/fax port <i>c</i> .
VOICE CHANNEL [n/c] INPUT LEVEL: <i>nn</i> dBm	Event	The current dBm level for voice/fax port <i>c</i> on node <i>n</i> is <i>nn</i> (–25 to +1) dBm.
VOICE CHANNEL [n/c] LOCAL LOOP TEST	Diag	Voice or fax port <i>c</i> on node <i>n</i> has started the diagnostic local loop test.
VOICE CHANNEL [n/c] RESET	Event	The voice or fax port has been reset and re-initialized to the current configuration.
VOICE CHANNEL [n/c] SELF TEST FAIL	Diag	Voice or fax port <i>c</i> on node <i>n</i> has completed the internal diagnostic tests unsuccessfully.
VOICE CHANNEL [n/c] SELF TEST PASS	Diag	Voice or fax port <i>c</i> on node <i>n</i> has completed the self diagnostic tests successfully.
VOICE CHANNEL [n/c] TEST CLEARED	Event	Voice or fax port <i>c</i> on node <i>n</i> has cleared (stopped) the current diagnostic test.
<WAITING Q= <i>n</i> >	Dialog	Sent whenever the port is placed in a queue (after requesting a class which is busy). This message will appear whenever a printable character is typed or <cr> pressed; it indicates your place (<i>n</i>) in the queue.
WRONG HARDWARE PLATFORM!!	Info	You have attempted to download a code that is intended for a different hardware platform.
<i>ni ds</i> YELLOW ALARM	Alarm	A Red Alarm was detected at a remote location on <i>ds</i> .
<i>ni ds</i> YELLOW ALARM CLEARED	Alarm	The remote Red Alarm is now cleared on <i>ds</i> .

LCD Messages

Message Type:

E/A = Event or alarm message.

Info = Information message.

Key:

ni = Node ID.

ci = Indicates a channel number.

n / c = Node ID/channel number.

ml = Module location letter [B-D].

nn = Variable value.

Table B-2. LCD Messages

Message	Message Type	Explanation
<i>ni [ml]</i> Adding checksums. .	Info	The Integration Router Module is performing checksums on the new code which has just been downloaded.
Are you sure?	Info	Reset is requested. If answer is yes proceed with reset by pressing the EXEcute key. If the answer is no, terminate without a reset by pressing <i>any other key</i> except the EXEcute key.
Are you sure? EXE forces a reset	Info	You attempted to reconfigure node number and ID. This invokes a reset and this message. Press EXE to accept new configuration and invoke the reset. Press any other key to abort.
Battery low <i>ni</i>	E/A	CMOS battery at node <i>ni</i> is low and a power loss could result in a cold start of the unit.
<i>ni [ml]</i> CCM Bad checksum.	Event	The Integration Router Module code download file was not received correctly. Three possible reasons are the following: • Wrong image file • Corrupted file • Incomplete transmission
<i>ni [ml]</i> CCM Header fail.	Event	The header portion of the Integration Router Module code download file was not received correctly.
<i>ni [ml]</i> CCM Downloading	Info	Code download to the Integration Router Module is in progress.
<i>ni [ml]</i> CCM Load waiting	Info	The Integration Router Module is ready for code download via a CCM async port.

Table B-2. LCD Messages (continued)

Message	Message Type	Explanation
<i>ni [ml]</i> CCM Load success.	Info	The code download to the Integration Router Module is completed.
<i>ni [ml]</i> Boot <i>nnn-nnnn-nx</i>	Info	The Integration Router Module has been reset and is using the version of software indicated.
Channel not available	Info	Selected port is inoperative or module location is empty.
Channel type not applicable	Info	Port configuration for selected port does not apply for the function requested. Example: You request a channel reset for a port configured as a link.
<i>ni</i> CMOS Error	E/A	NetRunner software has detected a problem writing to the configuration area. Contact your service representative.
<i>ni [ml]</i> \$DLD Connected.	Info	The Integration Router Module is connected to the download facility and is ready for code download.
<i>ni [ml]</i> Done	Info	The Integration Router Module has erased its Flash EPROMs in preparation for code download.
<i>ni [ml]</i> Erasing flash. . .	Info	The Integration Router Module is erasing its Flash EPROMs in preparation for code download.
<i>ni [ml]</i> File header read failed.	Event	The header data received for the code download file was not correct for the Integration Router Module.
<i>ni [ml]</i> File loaded failed, <i>nnnnnn</i> bytes loaded	Event	The Integration Router Module code download data transfer started but did not successfully complete. The number of bytes actually transferred is <i>nnnnnn</i> .
Invalid name character/s	Info	Selected text contains a character(s) or embedded spaces which are not allowed. Example: Selecting a node name that begins with a numeric or contains embedded spaces.
Invalid password	Info	Password entered does not match the configured password.
<i>ni/ml</i> LAN Module down	Info	LAN module in <i>ml</i> is not available for use.
<i>ni/ml</i> LAN Module up	Info	LAN module in <i>ml</i> is operating and available.
LAN Reset: LAN→LAN reload	Info	The Integration Router Module is resetting in preparation for code download via the LAN (from a Bootp/TFTP server).

Table B-2. LCD Messages (continued)

Message	Message Type	Explanation
LAN Reset: Bad command length	Alarm	The length of the message being received is too long. Verify the proper operation of your LAN module.
LAN Reset: No activity t/o	Event	LAN module is non-responsive and is resetting.
LAN Reset: Via Command Facility	Event	A LAN module reset has been initiated at the Command Facility.
LAN Reset: Via LAN module	Event	A user on the LAN side has initiated a LAN module reset.
LAN Reset: WAN→LAN reload	Info	The Integration Router Module is resetting in preparation for code download via a CCM async port.
Link down <i>ci</i>	E/A	Local unit has timed out (30 seconds) waiting for sync to be acquired on link <i>ci</i> . Check cabling, modem, and remote unit for errors.
Link restored <i>ci</i>	E/A	Link <i>ci</i> has been restored and is in sync.
Local link reset <i>ci</i>	E/A	Local link <i>ci</i> has been reset.
New date: <i>nn/nn</i>	E/A	Appears at the beginning of each new day and when reconfigured.
No action taken. Depress any key	Info	You elected to terminate a reset request by pressing any key other than the EXEcute key when the display prompted <i>Are You Sure?</i>
<i>ni [ml]</i> No Bootp reply	Event	There was no response to the Integration Router Module's Bootp request broadcast for code download.
No device associated with channel	Info	Selected link has no integral device associated with it.
No device response	Info	The selected port is temporarily busy. Usually a second attempt will succeed.
No system messages	Info	Message log is currently empty.
No voice installed. Depress any key	Info	No voice/fax module is installed in requested port location.
Number already in use. Depress any key	Info	You are trying to assign a local node number that has already been assigned.
Out of range	Info	Selected port exceeds the available number for type of module installed in selected module location. Example: The selection is for A10. On the CCM (module A), there is no designated port 10.

Table B-2. LCD Messages (continued)

Message	Message Type	Explanation
Remote link reset <i>ci</i>	E/A	Remote link (<i>ci</i>) has been reset.
Reset issued. System initializing.	Info	Requested cold reset is executing. System is initializing to the factory default settings.
<i>ni [ml]</i> Requesting TFTP:	Info	The Integration Router Module has broadcast a TFTP GET request for code download.
Self test passed	E/A	All power-up diagnostics have been successfully completed.
Slot empty or module ID invalid	Info	Hardware Overview option from the Configure Local Nodes menu has been selected, and module location is either empty or the ID of the installed module is somehow invalid.
Terminated	Info	A diagnostic test has been stopped (terminated).
<i>ni [ml]</i> TFTP Access denied	Event	The Integration Router Module does not have permission to access the code download file on the Bootp/TFTP server.
<i>ni [ml]</i> TFTP Bad checksum	Event	- The code download data received by the Integration Router Module from the Bootp/TFTP server was corrupted. - There was no response to the Integration Router Module's TFTP GET request to the Bootp/TFTP server for code download.
<i>ni [ml]</i> TFTP Downloading	Info	The Integration Router Module is receiving code download data from a TFTP server.
<i>ni [ml]</i> TFTP Load success	Info	The Integration Router Module code download from a TFTP server was successful.
<i>ni [ml]</i> TFTP No such file	Event	The file that the Integration Router Module requested to download from the Bootp/TFTP server does not exist.
Warning: Reset occurs. EXE to execute	Info	You requested a menu option that involves a warm reset. This occurs in some channel loopback and integral diagnostic selections. Press EXEcute to continue, any other key to abort.

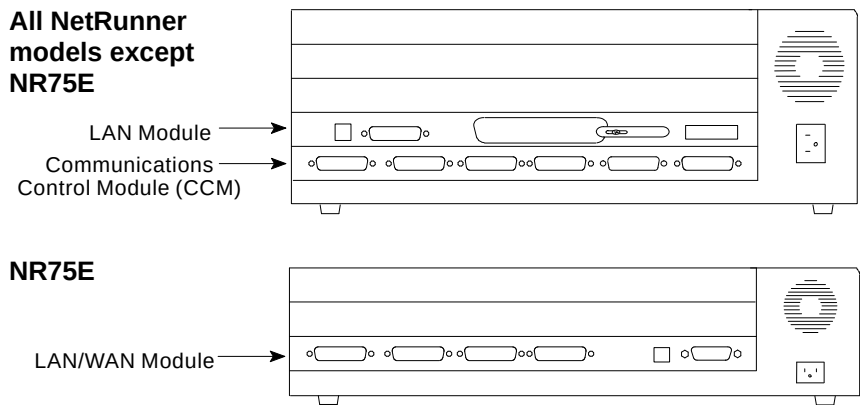
Specifications C

Physical Specifications C-1

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Defaults C-8

The following illustrates the connectors of the NetRunner unit. For pin assignments, see the Installation and Cabling manual.



Physical Specifications

<i>Ethernet Interface</i>	Software-selectable for IEEE 802.3 compatible 15-pin AUI connector or 8-pin modular jack for unshielded twisted pair LANs.
<i>Wide Area Network Interface</i>	Female, DB-25, EIA-232 (CCITT V.24/V.28); serial synchronous; internal/external clocking; full-duplex.
<i>Connector Interface</i>	In addition to the above, the NR75E's port A1 can be jumper-configured as either RS-232 (V.24), V.35, or X.21.
<i>Size (all models except NR75E)</i>	
Width	17.5 inches (44.5 cm)
Height	6.5 inches (16.5 cm)
Depth	12 inches (30.5 cm)
Weight	22 lbs (10 kg)

Size (NR75E)

Width	17.4 inches	(44.2 cm)
Height	4.4 inches	(11.2 cm)
Depth	11.8 inches	(30 cm)
Weight	13 lbs	(5.9 kg)

Power

100-240 Vac -5%, +10%
 3-1.5 amps (all models except NR50E)
 2-1 amps (for NR50E and NR75E only)
 47-63 Hz
 135 watts maximum

Operating Environment

Temperature

Operating

32 to 122°F (0 to 50°C)

Storage

-40 to +158°F (-40 to 70°C)

Humidity

Operating

10 to 90% relative humidity (noncondensing).

Storage

0 to 95% relative humidity (noncondensing).

Keypad

5 button (not on the NR50E and NR75E models)

Lithium Battery

One located on the base module and one on the LAN module, or one on the NR75E LAN/WAN module, the battery preserves the configuration of the CMOS RAM for eight to ten years.

Agency Compliance

Safety

UL 1950:1993
 CSA Standard C22.2 No. 950:1993
 IEC 950:1991+A1:1992
 TÜV: EN60950:1992
 EN 41003:1993
 VDE 0805

Electromagnetic

Compatibility

FCC Part 15 Level A
 C.R.C., c. 1374
 EN55022 (CISPR-22 Level B)
 EN50082-1:1992
 IEC 801-2:1991/prE55024-2:1992
 3kV CD, 8Kv AD
 IEC 801-3:1984/prE55024-3:1992, 3 V/m
 IEC 801-4:1988/prE55024-4:1993,
 0.6kV Signal, 1kV Power

Telephone Registration
 (as applicable)

FCC Part 68
 DOC 0S-03
 BABT 340, Sixth Edition
 BZT A108475D

Functional Specifications

WAN Link Protocol

MicroBand ATM: MICOM proprietary
Frame Relay: ANSI/CCITT standard

NR2000ED, NR2000E

Interconnect Links
Data Rates

0-12
Up to 128 Kbps full-duplex

Local
Interconnect Links
Data Rates

0-5
64-256 Kbps full-duplex
(0-2 recommended for mixed terminated traffic)
(0-4 LAN termination only)

Secondary
Interconnect Links
Data Rates

0-6
Up to 128 Kbps full-duplex

Frame Relay Access Links
Number of Utilized
DLCIs (Maximum)
CIRs
Frame Size

0-6
24
User-determined
Up to 8189 octets of information per frame
(including frame header). Does not include
CRC.

Voice
Trunk Clocking Rates

80% of CIR
56 Kbps - T1

NR1000E

Interconnect Links
Data Rates

0-12
Up to 128 Kbps full-duplex
(0-4 LAN termination only)

Local Interconnect
Links
Data Rates

0-4
64-256 Kbps full-duplex
(0-2 recommended for mixed terminated traffic)
(0-4 LAN termination only)

Secondary Interconnect
Links
Data Rates

0-6
Up to 128 Kbps full-duplex

Frame Relay Access Links
Number of Utilized
DLCIs (Maximum)
CIRs
Frame Size

0-6
16
User-determined
Up to 8189 octets of information per frame
(including frame header). Does not include
CRC.

Voice
Trunk Clocking Rates

80% of CIR
56 Kbps - T1

NR500ET

Interconnect Links	0-3
Data Rates	Up to 128 Kbps full-duplex
Local	
Interconnect Links	0-2
Data Rates	64-256 Kbps full-duplex
Secondary	
Interconnect Links	0-2
Data Rates	Up to 128 Kbps full-duplex
Frame Relay Access Links	0-4
Number of Utilized	
DLCIs (Maximum)	12
CIRs	User-determined
Frame Size	Up to 8189 octets of information per frame (including frame header). Does not include CRC.
Voice	80% of CIR
Trunk Clocking Rates	56 Kbps – T1

NR75E

Interconnect Links	0-1
Data Rates	Up to 64 Kbps full-duplex
Local	
Interconnect Links	n/a
Secondary	
Interconnect Links	0-1
Data Rates	Up to 64 Kbps full-duplex
Frame Relay Access Links	0-2
Number of Utilized	
DLCIs (Maximum)	8
CIRs	User-determined
Frame Size	Up to 8189 octets of information per frame (including frame header). Does not include CRC.
Voice	80% of CIR
Trunk Clocking Rates	56 Kbps – T1

Router Interface

Protocols Supported	All LAN protocols, including use of oversize packets in Novell NetWare.
Compression	LAN data compressed up to 4:1. Compression of IP, IPX, and LAT headers up to 10:1.
Filters	Automatic filtering on destination address. User-invoked filtering for broadcast, multicast, source address, protocol type, pattern match.

Spanning Tree	IEEE 802.1D compliant Compatible with all 802.1D compliant bridges.
Management Interface	Locally via NetRunner Command Facility. Remotely from any node in NetRunner network. From LAN via LAT or Telnet connection. SNMP agent with public domain MIB II (monitor only).
Performance	
Filtering Rate	8,000 frames per second (64-byte packets)
Forwarding Rate	185 to 490 frames per second. Forwarding rate is dependent on the specific Integration model, which FEATUREPAK or FlashPak cartridge is used in the LAN module, and other traffic types
<i>Command Facility</i>	
Status Displays	System status and port activity indicator lights.
Command Facility	Menu driven. Provides message broadcast, dynamic channel configuration, centralized troubleshooting, alarm messages, and periodic reports.
Diagnostics	Local channel tests, local and remote composite loopback tests, data output test, integral modem module tests, ISU module tests, voice/fax module tests and control signal monitoring.
Multiplexing Technique	<i>MicroBand</i> ATM — dynamically combines voice, fax, async, sync and LAN data onto one communications link.
Transparency	Normally transparent to ASCII user data. However, a port configured as <i>terminal</i> is transparent only when the data link is operational. The terminal port transmits <i>link down</i> in response to ^X when the link is not operational. A port configured as <i>host</i> is always transparent to ^X. Command Facility functions are activated by a ^X <break> or ^X^Y sequence. Transparency to these sequences is obtained by disabling the Command Mode using the Channel Features Menu.

Asynchronous Channel Specifications

<i>Capacity</i>	0-29 Ports (75E model) 0-41 Ports (all other models)
<i>Speed</i>	50 - 38,400 bps
<i>ABR</i>	to 19.2 Kbps
<i>Parity</i>	Odd, Even, Mark, Space, None
<i>Stop Bits</i>	1, 1.5, 2
<i>Characters</i>	5-8 bits/character plus parity (code levels 5 through 9)
<i>Classes</i>	64
<i>Delay Characteristics</i>	
Async	40 msec depending upon channel and composite speed
Sync	30-40 msec @ 9600 baud Satellite operation will affect delay time

All ports present themselves as DCE.

Synchronous Channel Specifications

<i>Protocols</i>	DLC, ASCII Bisync, EBCDIC Bisync, H-P Sync, RTS/CTS, Sync-Pad, MICOM DLC, MICOM Voice, Fast Packet, and TDM
------------------	---

All ports present themselves as DCE.

NR2000ED, NR2000E

<i>Capacity</i>	0-18 Ports at 9,600 bps
<i>Clock rate</i>	
ASCII Bisync, H-P Sync, EBCDIC Bisync:	1200 - 19,200 bps
MICOM DLC, RTS/CTS, Sync-Pad:	1200 - 48,000 bps
MICOM Voice:	9600 - 14,400 bps
DLC, Fast Packet, TDM:	1200 - 64,000 bps

NR1000E

<i>Capacity</i>	0 - 14 Ports at 9,600 bps
<i>Clock rate</i>	
ASCII Bisync, H-P Sync, EBCDIC Bisync:	1200 - 19,200 bps
Sync-Pad, RTS/CTS, MICOM DLC:	1200 - 48,000 bps
MICOM Voice:	9600 - 14,400 bps
Fast Packet, TDM, DLC:	1200 - 64,000 bps

NR500ET

Capacity 0 - 12 Ports at 9,600 bps

Clock rate

ASCII Bisync, H-P Sync, EBCDIC Bisync:	1200 - 19,200 bps
Sync-Pad, RTS/CTS, MICOM DLC:	1200 - 48,000 bps
MICOM Voice:	9600 - 14,400 bps
Fast Packet, TDM, DLC:	1200 - 64,000 bps

NR75E

Capacity 0 - 1 Port (A2 or A3)

Clock rate

DLC, ASCII Bisync, H-P Sync, RTS/CTS, Sync-Pad, EBCDIC Bisync,	
MICOM DLC:	1200 - 19,200 bps
MICOM Voice:	9600 - 14,400 bps
Fast Packet, TDM:	1200 - 38,400 bps

Defaults

The factory defaults are presented in the following tables.

Table C-1. Async Channel Configuration

Menu Item	Default
Channel Characteristics	
Data Rate	9600
Code Level	8
Parity	None ¹ Odd ²
Stop Bits	1
Echo	Off
Channel End to Host/to Terminal	Terminal
XON Character	DC1
XOFF Character	DC3
Buffer Control	XON/XOFF
Flow Control	XON/XOFF
CR Delay	0
LF Delay	0
FF Delay	0
Channel Features	
Priority	High
EIA Control	Enable
Smooth Scroll	Off
Tandem	No
Flow Control Strip	Pass
HP ENQ/ACK	No
Sync Loss Disconnect	No
Command Mode Entry Sequence	^X Break
Command Mode Access	Enable
Command Facility Main Menu Access	Enable
Local Channel Configuration	Enable
¹ If Code Level = 5-8	
² If Code Level = 9	

Table C-1. Async Channel Configuration (continued)

Menu Item	Default
Extended Features	
Data Compression	Enable
Remote CTS Control	Forced On
Switching Parameters	
Connect Protocol	Dedicated
Unbalanced Rates	On
Call Inhibit	No
Receive Inhibit	No
Character Set	ASCII
Matrix Switching	Enable

Table C-2. Unit Parameters

Menu Item	Default
Event Reporting	Off
Alarm Reporting	On
Switch Statistics Reporting	On
Periodic Reporting Interval	60 (Minutes)
Output Event/Alarm Reports	Local Command Port
Output Periodic Reports	Local Command Port
External Modem Priority	High
External Alarm Relay	Disable
No Activity Timeout	15 (Minutes)
Passwords	None (NULL Passwords)
Mesh	Off

Download Parameter

\$DLD Activity Timeout	120 (Seconds)
CCM Bank to Activate with Reset	Most Recent

Table C-3. Primary and Secondary Link Parameters

Menu Item	Default
Primary Link Control Parameters	
Terminates Switched Voice Calls	No
Forced On	Yes
Secondary Link Parameters	
Secondary Link Backup Only	On
Terminate Switched Voice Calls	No
Forced On	No
Link Rate	Sync External Clocks
Frame Relay Link Parameters	
Clock Speed	64000
Port Clocking	Tx-External/Rx-External
Maximum Frame Size	4096
Local Management Protocol	Annex D
DLCI Parameters	
Committed Burst Size Forward (Bc.Fwd)	0
Committed Burst Size Backward (Bc.Bwd)	0
Excess Burst Size Forward (Be.Fwd)	0
Excess Burst Size Backward (Be.Bwd)	0
Committed Information Rate Forward (CIR.Fwd)	0
Committed Information Rate Backward (CIR.Bwd)	0
Local Management Protocol Parameters (Annex D and LMI Rev. 1)	
Full Status Polling Counter (N391) (nN1)	6
Error Threshold (N392) (nN2)	3
Monitored Events Count (N393) (nN3)	4
Link Integrity Verification Timer (T391) (nT1)	10
Polling Verification Timer (T392) (nT2)	15
Access Link Mode	User

Table C-4. Dialog Messages

Menu Item	Default
Channel Password	ENTER PASSWORD
Welcome	None
Class Request	ENTER CLASS
Class Password	ENTER CLASS PASSWORD
Connected	CONNECTED
Queue	WAITING Q = n
Busy	BUSY
Disconnected	DISCONNECTED
No Answer	NO ANSWER
Unavailable	UNAVAILABLE
Unassigned	UNASSIGNED
Incompatible	INCOMPATIBLE
Call in Progress	CALL IN PROGRESS

Table C-5. NetRunner Default Node Number and ID

Unit	Default Node Number	Default Node ID
NetRunner Unit	240	!240

Table C-6. Port Configuration

Menu Item	Default
Port A1	Interconnect Link
Port A2, and above	Async
Set Link Rate for Interconnect, Frame Relay Local Interconnect, and Mux Links	Sync External Clocks

Table C-7. Sync Channel Characteristics

Menu Item	Default
Sync Protocol	DLC
DLC Protocol	
Data Rate	2400
Channel Clocking	Tx-Internal/Rx-Internal
Maximum Transmit Block Size	512
Maximum Receive Block Size	512
Interface Type	To DTE
Carrier Mode	Constant
Encoding	NRZ
Idle Fill	Flag Fill
Buffer Control	None
Clock Flow Control	Enable
DSR Control	Normal
Priority	Low
Claimed Bandwidth	0
Transmit Rate	Channel Rate
ASCII Bisync, EBCDIC Bisync	
Data Rate	2400
Channel Clocking	Tx-Internal/Rx-Internal
Maximum Transmit Block Size	512
Maximum Receive Block Size	512
Interface Type	To DTE
Carrier Mode	Constant
Sync Character	*
Number of Leading Syncs	3
Pad Character	FF (hexadecimal)
Number of Leading Pad Characters	1
Number of Trailing Pad Characters	2
Buffer Control	None
Clock Flow Control	Enable
DSR Control	Normal
Priority	Low
Claimed Bandwidth	0
* ASCII = 16 EBCDIC Bisync = 32	

Table C-6. Sync Channel Characteristics (continued)

Menu Item	RTS/CTS	Default
Data Rate		2400
Channel Clocking		Tx-Internal/Rx-Internal
Maximum Transmit Block Size		512
Maximum Receive Block Size		512
Interface Type		To DTE
Carrier Mode		Variable
Sync Character		FF
Number of Leading Syncs		3
Pad Character		FF (hexadecimal)
Number of Leading Pad Characters		3
Number of Trailing Pad Characters		3
Buffer Control		None
Clock Flow Control		Enable
DSR Control		Normal
Priority		Low
Claimed Bandwidth		0
Sync-Pad		
Data Rate		2400
Channel Clocking		Tx-Internal/Rx-Internal
Maximum Transmit Block Size		512
Maximum Receive Block Size		512
Interface Type		To DTE
Carrier Mode		Constant
Sync Character 1		16
Sync Character 2		16
Number of Leading Syncs		3
Pad Character		FF (hexadecimal)
Number of Leading Pad Characters		1
Number of Trailing Pad Characters		2
Buffer Control		None
Clock Flow Control		Enable
DSR Control		Normal
Priority		Low
Claimed Bandwidth		0

Table C-6. Sync Channel Characteristics (continued)

Menu Item	Default
H-P Sync	
Data Rate	2400
Channel Clocking	Tx-Internal/Rx-Internal
Maximum Transmit Block Size	9876
Maximum Receive Block Size	9876
Interface Type	To DTE
Carrier Mode	Constant
Sync Character	16
Number of Leading Syncs	3
Pad Character	FF (hexadecimal)
Number of Leading Pad Characters	1
Number of Trailing Pad Characters	2
Buffer Control	None
Clock Flow Control	Enable
DSR Control	Normal
Priority	Low
Claimed Bandwidth	0
MICOM DLC	
Data Rate	2400
Channel Clocking	Tx-Internal/Rx-Internal
Interface Type	To DTE
Carrier Mode	Constant
Buffer Control	None
Clock Flow Control	Enable
DSR Control	Normal
Priority	Low
Claimed Bandwidth	0

Table C-6. Sync Channel Characteristics (continued)

Menu Item	MICOM Voice	Default
Data Rate	9600	
Channel Clocking	Tx-Internal/Rx-Internal	
Maximum Transmit Block Size	1024	
Maximum Receive Block Size	1024	
Interface Type	To DTE	
Carrier Mode	Constant	
Buffer Control	None	
Clock Flow Control	Enable	
DSR Control	Normal	
Priority	Low	
Claimed Bandwidth	0	
TDM		
Data Rate	2400	
Channel Clocking	Tx-Internal/Rx-Internal	
Interface Type	To DTE	
Sync Character	FF (hexadecimal)	
DSR Control	Normal	
Fast Packet		
Data Rate	2400	
Sync Character	FF (hexadecimal)	
DSR Control	Normal	
Priority	Low	
Claimed Bandwidth	0	

Glossary

This glossary contains terms used throughout the manual, as well as terms commonly used in the data/voice communications field.

ABR, autobaud rate detection

A process by which a receiving device determines the data rate, code level, and stop bits of incoming data by examining the first character received (usually a preselected sign-on character). ABR allows a receiving device to accept data from a variety of transmitting devices operating at different speeds, which means that the receiver does not need to be configured for each specific data rate in advance.

access channel

The industry-standard term for the frame relay link.

access rate (AR)

The data rate of the frame relay link. The speed of the frame relay link determines how rapidly (maximum rate) the end user can inject data into the frame relay network.

ACK, acknowledgment

A control character used as a reply in communications protocols. For example, in Hewlett-Packard's ENQ/ACK protocol, ACK is sent by the receiving device as a reply to ENQ sent by the transmitting device.

adapter

A device for connecting two items of physically dissimilar types (e.g., an adapter may change an RJ45 connector to a DB-25 connector). Contrast with converter.

aggregate input rate

The sum of all data rates of terminals and computer ports connected to a multiplexer. Burst aggregate input rate refers to the instantaneous maximum data input rate accepted by the multiplexer.

analog

Continuously variable as opposed to discretely variable. Physical quantities, such as temperature, are continuously variable and so are described as analog; analog signals vary in accordance with the physical quantities they represent. The public telephone network was designed to transmit voice in analog form. Contrast with digital.

analog loopback

A diagnostic test that forms the loop at the data communications equipment's telephone line interface, returning transmitted signals to their source.

Annex D

A common management protocol used for frame relay.

AppleTalk

Allows LAN networking among Macintosh computers. All Macintoshes have a LocalTalk port, running AppleTalk over a 230 kbit serial line. AppleTalk also runs over Ethernet (EtherTalk) and Token Ring (TokenTalk) network media.

ARQ, automatic request for retransmission

An error control method in which the receiving device informs the transmitting device which transmission blocks were received successfully. The transmitting device retransmits any blocks not successfully received.

ASCII, American Standard Code for Information Interchange

A 7-bit-plus-parity character set or code established by the American National Standards Institute (ANSI) to achieve compatibility between data services.

async

Short for asynchronous that describes the method of transmission for data. *See* asynchronous transmission.

asynchronous transmission

A method of sending data in which the interval between characters may be of unequal length. The characters transmitted include a start bit and one or more stop bits, which define the beginning and ending of the character. No timing signals need to be sent.

ATM, asynchronous transfer mode

Method of data transmission using cell relay, supporting speeds up to 2.2 gigabits/second, and capable of carrying voice and LAN traffic.

attenuation

Deterioration of a signal's strength as it passes through a transmission medium; generally attenuation increases with both frequency and cable length. The signal level decreases. Attenuation is measured in terms of decibels. Contrast with gain.

autocall

Technique used by voice ports to establish a switched virtual circuit to a pre-defined destination without the telephone equipment sending dialing digits. Similar to the async channel *fixed destination*.

backbone

The primary path of the network or LAN over which the majority of traffic is routed.

backup link

See secondary interconnect link.

backward explicit congestion notification (BECN)

A bit set by a frame relay network to notify the data terminal equipment (DTE) interface device that congestion avoidance procedures should be initiated by the sending device.

baud

A unit of signalling speed. The speed in baud is the number of discrete conditions or signal events per second. If each signal event represents one bit, the baud rate is the same as bps. If each signal event represents more than one bit, as in quadrature amplitude modulation, the baud rate is smaller than bps.

BCC, block check character

A character added to the end of a transmission block for the purpose of error detection.

Bc, committed burst size

The maximum amount of data in bits that a network agrees to transfer under normal conditions over a measurement interval (T). Data may or may not be contiguous. Bc is negotiated with the carrier provider.

Be, excess burst size

The maximum amount of uncommitted data in bits that the network will attempt to deliver over a measurement interval (T). This data may or may not be contiguous. Be is negotiated with the carrier provider.

bit

Contraction of binary digit. This is the smallest unit of information and the basic unit in digital data communications. A bit can have a value of zero or one (mark or space in data communications terminology).

block

The part of an Integration unit's stacking connector that is mounted on the top side of a module.

bps, bits per second

A standard for measuring the rate of data; the number of bits passing a specific point each second.

break or <break>

A spacing condition that exists longer than one character time. Break is often used by a receiving terminal to interrupt the sending device's transmission, to request a disconnection, or to terminate a computer process.

bridge

Equipment connecting two similar local area networks (LANs). The bridge filters out packets that stay on the local LAN and forwards packets intended for the other LANs.

bridge network

Two or more LANs connected together by one or more bridges for other LANs.

bridge/router

A combination of a bridge and a router in a single device. *See also* bridge and router.

broadcast

The transmission of a message intended for general reception throughout a network rather than for a specific station on that network.

buffer

Temporary storage area to absorb the difference in transfer rates, or to collect data for more efficient block transferral.

burstiness

In the context of a frame relay network, data that uses bandwidth only sporadically; that is, information that does not use the total bandwidth of a circuit 100 percent of the time. During pauses, links are idle—no traffic flows across them in either direction. Interactive and LAN-to-LAN data is bursty in nature, because it is sent intermittently. In between data transmissions, the link experiences idle time waiting for the data terminal equipment (DTE) to respond to the transmitted data (user's input) or waiting for the user to send more data.

busyout

A configuration option in the voice module that is used to place the voice port into the *busy* state, effectively disabling the port.

byte

A collection of bits operated upon as a unit. Most bytes in data communications are 8 bits long and most character sets use one byte per character. The capacity of storage devices (such as RAM) is frequently given in bytes or in Kbytes (K=1024).

carrier

A continuous signal that is modulated with a second, information-carrying signal.

carrier frequency

The frequency of the signal (carrier), which is being modulated, to transmit data.

CCITT, Consultative Committee for International Telegraph and Telephone

See International Telecommunication Union – Telecommunication Standards Section.

CCM

See Communications Control Module.

CD, carrier detect

A control signal that indicates that the local modem is receiving a signal from the remote modem.

CEM

See channel expansion module.

central office, CO

The building where common carriers terminate customer circuits and where the switching equipment that interconnects those circuits is located.

channel

A path for electrical transmission between two or more points. Also called circuit, line, data link, or path. It may be asynchronous, synchronous, or voice.

channel expansion module, CEM

A data channel expansion module for an Integration unit that increases channel capacity depending on the specific module chosen.

channel loopback

A diagnostic test that forms the loop at the multiplexer's channel interface.

character

A letter, number, punctuation, or other symbol contained in a message. *See also* control character.

CIR, committed information rate

Used to set a predictable level of service to all users on the network, the CIR is a traffic management mechanism. The user estimates the normal traffic during a busy period, and the network commits the bandwidth to be allocated.

circuit

1) In data communications, a means of two-way communication between two points, consisting of transmit and receive channels. 2) In electronic design, one or more components that act together to perform one or more functions.

class

A name given to a group of one or more async channels. Classes are used to group similar ports for network users and may be viewed as a hunt group where an async user can connect to any available ports in the group.

clock

The timing signal used in synchronous transmission. Also, the source of such timing signals.

cluster

A group of local area networks which have been assigned the same name and are attached via Integration units. A means of organizing the LANs to reduce traffic over a wide area network link. The maximum number of LANs in a cluster is 12.

CNG (calling) tone

A 1.1 KHz interrupted tone, used by automatic fax machines to indicate that a fax message is about to be sent.

code

1) A set of rules that specifies the way data is represented, such as ASCII or EBCDIC. 2) A term used to describe the Integration system software.

code download

A feature allowing the user to download new software to a unit's Communications Control Module (CCM), Integration Router Module, or any analog or digital voice module except 5000VM and 5000IVM. Software may be downloaded locally or remotely via PC or NETMan.

code level

The number of bits used to represent characters.

cold start

A system reset that returns the unit to the factory defaults. Also called a cold reset.

Command Mode

The Integration unit's menu-driven structure that supports local channel configuration, diagnostics, and access to the Command Facility.

Command Facility

The Integration unit's menu-driven structure containing all the configuration, diagnostic and administration options.

command port

A dedicated terminal used to control and monitor a multiplexer system. Also, the interface to which this terminal is connected.

committed burst size

See Bc.

committed information rate

See CIR.

committed rate measurement interval

See Tc

Communications Control Module

The main or base module of the Integration unit which contains the FEATUREPAK or FlashPak cartridge or on-board Flash memory that determines the functionality of the product. The major processing effort occurs within this module.

communications protocol

Means used to control the orderly exchange of information between stations on a data link or on a data communications network or system. Also called line discipline or protocol.

composite

The line-side signal of a multiplexer that includes all the multiplexed data, including asynchronous and synchronous data as well as digitized voice. Also known as a link. *See also* link.

composite link

The line that carries the composite data between units. Also known as a link.

composite loopback

A diagnostic test that forms the loop at the line side (output) of a multiplexer.

compression

The use of statistical methods to reduce the number of bits transmitted across a link, thus reducing bandwidth requirements.

conditioning

The *tuning* or addition of equipment to improve the transmission characteristics or quality of a leased voice-grade line so that it meets specifications for data transmission. The customer pays a monthly charge for conditioning.

configuration switch group

See switch group.

connection

An established data communications path, the process of establishing that path, or a point of attachment for that path.

connector

An electrical device for making one or more connections.

control character

A non-printing character used to start, stop, or modify a function.

control signal

A discrete interface signal used to indicate, start, stop, or modify a function.

converter

A device for connecting two items of electrically dissimilar types (example: RS-232 to V.35). Contrast with adapter.

CPU, central processing unit

The heart (main processor) of a computer system, or the computer system itself.

<cr>, carriage return

- 1) A code that exists within files and data streams as a line terminator.
- 2) A user-entered ASCII or EBCDIC control character used to position the print mechanism of a printer or the cursor on a terminal display to the left margin.

CRC, cyclic redundancy check

- 1) An error detection scheme in which the block check character is the remainder after dividing all the serialized bits in a transmission block by a predetermined binary number. Also, a polynomial based on the data transmitted.
- 2) A communications device that performs encapsulation. Frame-relay-capable routers and bridges are examples of devices used to interface the customer's equipment to a frame relay network. *See also* encapsulation.

CSA, Canadian Standard Association

A Canadian agency that generates standards, conducts tests, and certifies products to ensure their safety.

CSU, channel service unit

A digital data communications equipment (DCE) unit for data phone digital servers (DDS) lines; interfaces with data service unit (DSU) on customer's premises.

CTS, clear-to-send

An RS-232 interface control signal which indicates to a data terminal equipment (DTE) that it may begin transmitting. Usually issued in response to request-to-send signal.

cyclic redundancy check

See CRC

data

Numbers, text, facts, instructions, and the like, which are represented in a formalized manner that can be manipulated and transmitted by machines.

data compression

A primary technology built into the Integration products. A block of data is compressed for transmission and decompressed upon reception. Fewer bytes are required for the transfer, thus increasing the data transfer rate.

data link connection

See DLC

data link connection identifier

See DLCI

data rate or data signalling rate

A measure of how quickly data is transmitted. It is best expressed in bps. It is, however, often incorrectly expressed in baud. Data rate is synonymous with speed.

dB, decibel

A comparative (logarithmic) measure of signal power, a ratio.

dBm

An absolute measure of signal power, where 0 dBm is equal to one milliwatt into 600 ohms.

dc signalling

A configurable option in an E&M-strapped voice/fax channel.

DCE, data communications equipment

The equipment that provides the functions required to establish, maintain, and terminate a connection (including signal conversion) for communications between a data terminal equipment (DTE) and a telephone line or data circuit. Also, interface signals typically presented by this equipment.

DDS, dataphone digital services

A communications service offered by the telephone company to transmit data in digital form.

DE, discard eligibility

A user-set bit indicating that a frame may be discarded in preference to other frames if congestion occurs, to maintain the committed quality of service within the network. Frames with DE bit set are considered Be data.

delta topology

The simplest form of ring and mesh topology, involving three nodes that are fully interconnected with one another. If one link fails or if there is link congestion, there is an alternate path for all nodes. *See also* mesh topology.

dial-up line, dial line

A circuit or connection on the public telephone network.

DID, direct inward dialing

A service offered by the telephone company allowing an outside caller to dial an internal extension without passing through the operator. Billing does not start until the extension answers.

digital loopback

A diagnostic test that forms the loop at the communication device's data terminal equipment (DTE) interface.

DISA, direct inward system access

A service offered by a PBX that allows incoming calls to the PBX to have dialing access within the private network. It may often be protected by a dialed password. Billing starts when the PBX provides the dial tone.

discard eligibility

See DE

disconnect supervision

A voice feature which indicates to the local user that the remote end has gone off-hook. This feature is significant in loop start application, where disconnect is denoted by removal of power to the station equipment.

DIT, direct in termination

A service offered by a PBX that allows incoming calls to the PBX to be routed directly to a selected telephone or group of telephones without operator intervention. Billing does not start until the telephone answers.

DLC, data link connection

The frame relay data stream.

DLC, data link control

A bit oriented communications protocol that sets up, controls, checks, and terminates information transfer between two stations on a data link.

DLCI, data link connection identifier

1) To identify the different DLCs in a frame relay link, each DLC is assigned a data link connection identifier (DLCI) when a frame relay call is being established. 2) A unique number assigned to a permanent virtual circuit (PVC) endpoint in a frame relay network. Identifies a particular PVC endpoint within a frame relay link in a network; it has local significance only to that link. During the data transfer phase, all the frames belonging to a frame relay call carry the same DLCI in the link layer address field of each frame.

domain

A grouping of LAN nodes in TCP/IP networks that has been assigned a logical name.

downline loading

The process of sending configuration parameters, or operating software, from a controlling device to another device.

DSP, digital signal processor

This microprocessor is used in voice compression and fax demodulation.

DSR, data set ready

An RS-232 interface control signal that indicates that the data communications equipment (DCE) is connected to a telephone circuit. Usually a prerequisite to the data terminal equipment (DTE) issuing RTS.

DSU, data service unit

Data communications equipment (DCE) that replaces a modem in connection to a dataphone digital servicer (DDS): A baseband device, often included in the cost of the DDS circuits.

DSU/CSU

An external device that combines the functionality of a data service unit (DSU) and a channel service unit (CSU). *See also* DSU and CSU. Contrast with ISU.

DTE, data terminal equipment

The equipment serving as the data source and/or destination. May refer to computer ports, terminals, and printers. Also, interface signals typically presented by this equipment.

DTMF, Dual Tone Multifrequency

Used for call addressing in pushbutton telephones. Also known as Multifrequency Pushbutton (MFPB) in Europe.

DTR, data terminal ready

An RS-232 interface control signal that indicates that a data terminal unit (DTE) is ready for data transmission.

E&M

In industry usage, a signalling convention between voice PBXs. As related to MICOM's voice/fax modules, a strapping option for compatibility with the tie-trunk side of a voice PBX. There are five types (Type I through Type V) of E&M strapping options in domestic models, and three types (Types I, II, and V) in the international and universal models.

EasyRouter

MICOM's proprietary bridge/router software with IP ARP/IPX SAP/IPX RIP spoofing and data/header compression that resides in an HCF or HCFT LAN FlashPak cartridge. Part of the integral Integration Router Module.

EBCDIC, Extended Binary Coded Decimal Interchange Code

An 8-bit, IBM character code.

echo

The return of transmitted data to its origin.

egress

In a frame relay network, frames moving toward the destination device. Contrast with ingress.

Electronics Industry Association (EIA)

A trade organization that issues its own standards and contributes to American National Standards Institute (ANSI); they developed the RS-232 standard.

encapsulation

A process by which an interface device places an end device's protocol-specific information inside a frame relay frame. The network accepts only frames formatted specifically for frame relay; hence, devices acting as interfaces to a frame relay network must perform *encapsulation*.

enhanced interface module

An interface module (E&M, FXO, FXS) for MICOM's Universal Voice Module which is designed to meet all European and North American regulatory agency requirements.

ENQ, enquiry

A control character used as a request for identification or status in communications protocols. For example, in Hewlett-Packard's ENQ/ACK protocol, ENQ is sent by the transmitting device to determine if the destination terminal is ready for more data. *See also* ACK.

<esc>, escape

An ASCII or EBCDIC character that is used to modify the meaning of the character which follows (dependent on defined protocol). It is often used to set equipment in different modes of operation, to position a cursor on a terminal, or as a signal to computer programs.

explicit congestion notification

A mechanism to indicate the existence of congestion. The notification bits in the frame relay header are either forward (FECN) or backward (BECN). The process could take place simultaneously on multiple DLCIs in response to congestion on a given line or node, thus notifying multiple sources and destinations. *See also* FECN and BECN.

excess burst size

See Be.

fax, facsimile

Transmission of images (written, typed, or drawn material) through a voice/fax channel.

FCS, frame check sequence

The standard 16-bit cyclic redundancy check used for HDLC and frame relay frames. The FCS detects errors occurring in the bits of the frame between the opening flag and the FCS, and is only effective in detecting errors in frames of 4096 octets or smaller. *See also* CRC.

FECN, forward explicit congestion notification

Indicates congestion downstream or toward the destination. *See also* Explicit Congestion Notification.

FEATUREPAK cartridge

The cartridge containing the operating firmware for MICOM products. The FEATUREPAK contains a specific release of software from the factory and cannot be field upgraded. Contrast with FlashPak cartridge.

Federal Communications Commission (FCC)

A Government board that has the power to regulate all U.S. interstate communications systems as well as all international communications systems that originate or terminate in the U.S.

FF, form feed

A control character used to tell a terminal device to go to the top of the next page.

flash bank

A memory bank on the Integration unit's Communications Control Module (CCM) FlashPak, the Universal Voice Module (UVM), on an Integration Router Module, or on the 3K base module (CCM and voice side) into which new software is downloaded and from which software is loaded into the unit's RAM.

Flash memory

Flash memory allows for quick updating of MICOM software. *See also* network code download.

FlashPak cartridge

A cartridge containing the operating firmware for MICOM Integration products. The cartridge contains Flash memory, which allows software to be downloaded. Contrast with FEATUREPAK cartridge.

flow control

The procedure for controlling the transfer of data between two points in a data network, such as between a terminal and a multiplexer, to prevent loss of data when the receiving device's buffer reaches its capacity.

force connect(ed)

A dedicated connection between any two ports of the same type. Contrast with switching.

forward explicit congestion notification

See FECN.

fox message

A test message (THE QUICK BROWN FOX JUMPS OVER THE LAZY DOG. 1234567890) that contains all the letters of the alphabet and all the numerals. This is produced in the fox message generator within the unit.

frame check sequence

See FCS.

frame relay

An alternative wide area networking (WAN) connection to leased lines, providing multiple permanent virtual circuits (PVCs) or data link connection (DLCs) within the same physical access line.

frame-relay-capable interface device

A communications device that performs encapsulation. Frame-relay-capable routers and bridges are examples of devices used to interface the customer's equipment to a frame relay network. *See also* encapsulation.

FRAD, frame relay access device

The equipment used to access the frame relay network.

full-duplex

Simultaneous two-way independent transmission.

FXO, Foreign Exchange Office

An off-premise telephone extension. The Universal Voice Module offers an FXO interface. The equivalent term used in the domestic and international voice/fax module is OPX.

FXS, Foreign Exchange Station

In the voice environment, a telephone extension that has been extended off-premises. The Universal Voice Module offers an FXS interface. The equivalent term used in the domestic and international voice/fax module is KTS.

gateway

In LAN technology, a server that can access two or more different networks. As such, it can forward messages across networks that other hosts would not be able to access. The gateway generally has multiple IP addresses (one for each network). For example, a gateway might *live* at addresses 192.6.7.8 and 193.6.7.8. Hosts wishing to forward messages address the messages to the gateway, which passes them on to the other network. Contrast with bridge.

half-duplex

Transmission in one direction at a time.

hardware reset

Resets date and time but retains the current configuration. On Integration units this reset is accessed from the front.

header

Pins on a circuit board onto which a jumper can be installed for hardware configuration purposes.

host

The central computer (or computer systems) that provides primary data processing functions.

hub group

This term is most often used in discussions of switching. Each Integration unit is considered a hub. An Integration unit and all attached MICOM muxes form a hub group.

Hz, hertz

A measure of frequency or bandwidth equal to one cycle per second. Named after experimenter Heinrich Hertz.

indicator lights

The light emitting diodes on the front of the Integration unit.

ingress

In a frame relay network, frames moving from an access device toward the frame relay network. Contrast with egress.

input level

A level of relative analog signal strength obtained from the attached telephone equipment, as measured in the voice/fax module.

input level display

A voice channel visual indication of the input level as displayed by the voice/fax module. Used as a diagnostic tool to monitor the input signal level.

integrated service unit (ISU)

An interface device that combines the functions of a Digital Service Unit (DSU) and a Channel Service Unit (CSU); a module for an Integration unit. Contrast with DSU/CSU.

Integration Hub

A product in the STADIA family that offers a 12-slot chassis, which can house up to four Marathon or NetRunner CCMs and associated modules.

Integration Router Module

An integral module available on Integration units that offers router functionality. This LAN product is used to connect remote LANs across a WAN.

Integration unit

MICOM product which utilizes *MicroBand* ATM technology to multiplex data, voice, facsimile, and LAN traffic over low cost leased lines. The NetRunner, Marathon, and STADIA Integration Hub are members of this group.

interconnect link

A composite link that connects any two of the following units: Marathon, NetRunner or STADIA Integration Hub.

International Telecommunications Union - Telecommunications Standards Section, ITU-TSS

Formally the CCITT, this committee makes international communications recommendations to participating members. These are frequently adopted and made standards by national organizations. The ITU-TSS develops recommendations that pertain to interfacing, modems, and data networks. Membership includes various scientific and trade associations, as well as governmental and private companies.

Internet

A collection of TCP/IP world-wide networks and gateways, including ARPAnet, MILnet, and NSFnet.

IP Address

See Network Address.

IPX, Internet Packet Exchange

Novell NetWare's native local area network communications protocol.

jumper

A miniature connector that fits over, and electrically connects two pins.

Kbps, kilobits per second

One thousand bits per second. (Example: 19,200 bps is 19.2 Kbps.)

KTS, key telephone system

In industry usage, a key telephone system in which the telephones have multiple pushbuttons to allow users to select outgoing/incoming calls directly, without dialing an access number such as 9. Generally, a key telephone system has limited internal telephone-to-telephone capacity. As related to MICOM's domestic and international voice/fax modules, a strapping option for compatibility with KTS-type telephone interface equipment. In Universal Voice Module, the option is called FXS.

LAN, local area network

A data communications network confined to a limited geographic area (up to 6 miles or about 10 kilometers) with moderate to high data rates (230 Kbps to 100 Mbps). The area served may consist of a single building, a cluster of buildings, or a campus-type arrangement. It is owned by its user and includes some type of switching technology, and does not use common carrier circuits although it may have gateways or bridges.

LAPB, link access procedure balanced

The balanced-mode, enhanced version of HDLC. Used in X.25 packet-switching networks. Contrast with LAPD.

LAPD, link access procedure on the D-channel

A protocol that operates at the data link layer (layer 2) of the OSI architecture. LAPD is used to convey information between layer 3 entities across the frame relay network. The D-channel carries signaling information for circuit switching. Contrast with LAPB.

LAPF, link access procedure F (Frame Relay)

This is a common name applied to a modified LAPD specification which is defined in the CCITT Q.922 standard for frame relay. Basically it is similar to LAPD, but modified for frame relay.

LAT, Local Area Transport

A Digital Equipment Corporation proprietary local area network network communication protocol. The protocol is based on the idea of a relatively small, known number of hosts on a local network sending small network packets at regular intervals.

LCD, liquid crystal display

See liquid crystal display.

leased line

A telephone line reserved for the exclusive use of the leasing customer without interexchange arrangements.

legacy data

Non-local area network data, async and sync data traffic.

LF, line feed

A form of line termination in files and data streams. Also a control character used to tell a terminal device to go to the next line.

link

A communications circuit or transmission path connecting multiple points in a network, a composite. There are several types of link in the Integration product: An *Interconnect Link* connects any two Integration units over a leased line using an analog or digital circuit provided by the telephone company. A *Secondary Interconnect Link* connects to Integration units via a TA (Terminal Adapter), modem, or Switched 56 DSU/CSU. This link serves as a backup to an interconnect link. A *Local Interconnect Link* connects two Integration units (limited to specific models) located within 25 feet of each other (co-located). A *Frame Relay Link* connects two Integration units over the public frame relay network and provides multiple permanent virtual circuits (PVCs) within the access link. A *Mux Link* connects an Integration unit to a MICOM mux directly over a leased line using a line driver or modem. An *X.21 bis Link* connects an Integration unit to a MICOM mux over a *pay as you go* dial up line.

link access procedure balanced

See LAPB.

link access procedure on the D-channel

See LAPD.

liquid crystal display, LCD

The 80-character display in the front of 5-slot Integration units that consists of two 40-character lines. It is used for real time status and alarm messages, time-of-day, and by use of the adjacent keypad, it provides access to configuration, diagnostics, and administration functions.

local analog loopback

An analog loopback that forms the loop at the line side (analog output) of the local modem.

local channel loopback

A channel loopback that forms the loop at the input (channel side) of the local multiplexer.

local composite loopback

A composite loopback that forms the loop at the output (composite side) of the local unit.

local digital loopback

A digital loopback that forms the loop at the input (digital side) of the local modem.

local interconnect link

An interconnect link designed for connection between any two Integration units that are located in close proximity. This link is limited to specific models.

loopback or loopback test

A type of diagnostic test in which the transmitted signal is returned to the sending device after passing through all, or a portion of, the data communications link or network. This allows the technician (or built-in diagnostic circuit) to compare the returned signal with the transmitted signal. This comparison provides the basis for evaluating the operational status of the equipment and the transmission paths through which the signal traveled.

Marathon

Family of products that provide cost-effective integration of data, voice, fax and LAN communications to T1/1 speeds on public frame relay, ISDN and leased line services.

mark

In data communications, a binary 1 state, which is the steady, no-traffic state for asynchronous transmission.

mesh topology

A communications circuit or transmission path within a network that has *closed loops*. Since there is more than one path between nodes, mesh topology offers redundancy in the event of link failure or congestion. *Full mesh* topology occurs when all nodes are directly connected to all other nodes. *See also* delta topology *and* ring topology.

MIB, Management Information Base

A tree-structured database of management information stored within the internal memory of a local area network (LAN) device that is configured with an Simple Network Management Protocol (SNMP) agent. This database is used to monitor device operation and change device configurations.

MICOM mux

Those MICOM multiplexers that are compatible to an Integration unit. All ports on a MICOM mux are addressable by the network so that connections can be made on an individual basis. MICOM muxes are connected to an Integration unit via a mux or X.21 link.

MicroBand ATM

MICOM's networking protocol that forms the network backbone for integrated voice/fax/local area network data networks over sub-T1/E1 communications lines. This protocol is a combination of Fast Packet and Cell Relay technologies; each packet is exactly the same length (in contrast with V.21 and frame relay networks).

modem

Contraction of MODulator-DEModulator. A device that converts serial digital data from a data terminal equipment (DTE) to a signal suitable for transmission over a telephone line, and converts the received signal to serial digital data for the DTE. Also called a data set.

module

A printed circuit board and components with specific functionality that plug into one of the module locations on the unit.

module location

A physical and logical location of modules within a 3- or 5-slot chassis. These are described from bottom to top as module location A-E (or A-C in a 3-slot chassis). In the Integration Hub, this is the logical location of a module (B-E) in respect to its associated Communications Control Module (CCM) which is in location A.

ms, millisecond

One-thousandth of a second.

multicast

A message that is sent out to a group of local area network nodes by a host. Multicasts are generally sent at specified intervals to avoid cluttering the LAN, and contain the name of the host sending them as well as information about what services that host provides.

multiplexer

A device that combines the signals of many devices and types into a composite signal for transmission to a remote destination.

mux

Short for multiplexer. *See also* MICOM mux and multiplexer.

mux link

A composite leased line link that connects a MICOM mux to an Integration unit.

NAK, negative acknowledgment

A control character that indicates that the previous transmission block was received in error.

NETMan

The optional UNIX-based network management system for Integration networks.

NetWare

A Novell-developed local area network operating system that provides file and printer sharing among networks of personal computers.

network address

Every node on a local area network (LAN) Ethernet network has one or more addresses associated with it.

Every node has what is called a *hardware address* that is unique across every network everywhere, at any time. If you know a node's hardware address, you should be able to identify the exact piece of equipment to which it belongs. Hardware addresses are generally set up by the company that manufactured the equipment and should never change. This address is usually specified as a list of six hexadecimal numbers separated by dashes, such as ae-34-2c-1d-69-f1. The hardware address for the LAN module is shown on a label on the back panel of the module. In the case of TCP/IP networks, each node also has a *software* or *IP* address.

Every node also has a *software address* for each network protocol that node uses. The software address is configured by the network administrator. The software address format varies according to the network protocol:

- For TCP/IP, the software address is specified as four decimal numbers separated by periods (for example, 197.49.155.247). In this case, each number must be between 0 and 255, and each segment of the number corresponds to a different network or sub-network.
- For IPX, the software address is a combination of the LAN segment or WAN network number plus the node's own network number. IPX network numbers are in the range 1 to FFFFFFFE hexadecimal.
- For AppleTalk, the software address is assigned dynamically from a range of addresses configured into the network's seed router.
- For DECnet, the software address is a combination of the network area number plus the node's own network number, expressed in the form "area.node".

node

1) Any unit or MICOM mux in an Integration network. Each node has a unique name (id) and number. 2) In local area network (LAN) technology, any intelligent device physically connected to the network. A LAN node can be thought of as any device that has a hardware address.

nonvolatile

A term used to describe a data storage device (memory) that retains its contents when power is lost.

null character

A character (usually all bits set to mark) used to allow time for a printer's mechanical actions to take place so that the printer will be ready to print the next data character. Sometimes called idle character.

NULL password

A password *configured* for no password. A password can be deleted by configuring a NULL password.

off-hook

A line condition caused when a telephone handset is removed from its cradle, if the line is active.

on-hook

A line condition that exists when a telephone handset is resting in its cradle, if the line is active.

OPX, off-premises extension

In industry usage, an off-premise telephone extension. As related to MICOM's domestic and international voice/fax modules, a strapping option for compatibility with the station side of a voice PBX. In the Universal Voice Module, the interface is called FXO.

pad character

A character inserted to fill a blank time slot in a synchronous transmission or to fulfill a character count requirement in a transmission of fixed block length. In Integration units, leading pad characters help establish synchronization, and trailing pad characters prevent the dropping of the RLSD/RTS signal too soon after the end of a frame.

parameter

An element, the value of which characterizes the behavior of one or more variables associated with a given system.

parity, parity bit

A bit added to a character to ensure that the total number of 1s in a grouping of bits is either always even for even parity, or odd for odd parity. This permits detection of signal errors.

Part 15, FCC

A part of the FCC body of rules that defines the restrictions to the level of electromagnetic emissions for an electronic device.

Part 68, FCC

A part of the FCC body of rules that defines the technical requirements that an electronic device must meet before it can be connected to the telephone network.

PBX, private branch exchange

A privately owned phone system installed within the premises of an organization. It allows communication among users within the organization, as well as between those users and the outside world. It differs from a key telephone system in that the user must dial an access number, such as 9, to get an outside line.

PDN, public data network

A network established and operated by a Post Telephone, and Telegraph Authority (PTT), common carrier, or private operating company for the specific purpose of providing data communication services to the public.

permanent virtual circuit

See PVC.

point-to-point

A communications circuit or transmission path connecting two points. In the Integration unit that connection can be force connected (dedicated point-to-point) or switched (switched point-to-point).

port

A physical connector on the back of the Integration unit. Also, an interface capable of attaching to a device for communications with another device.

Power Plus

Redundant power supply kit available for any 5-slot Integration unit. Power Plus provides two separate power supplies which share the load equally; should one power supply fail, the other assumes the full load.

primary interconnect link

An interconnect link associated with a secondary link.

protocol

Any standard method of communicating over a network (LAN or WAN).

PTT, Post, Telephone, and Telegraph Authority

A government agency that functions as the communications common carrier and administrator in many areas of the world.

PVC, permanent virtual circuit

1) A logical link, whose endpoints and class of service are defined by network management. 2) (In frame relay) Analogous to an X.25 permanent virtual circuit, a PVC consists of the originating frame relay network element address, originating data link control identifier, terminating frame relay network element address, and termination data link control identifier (DLCI). Originating refers to the access interface from which the PVC is initiated. Terminating refers to the access interface at which the PVC stops. Many data network customers require a PVC between two points.

QAM, quadrature amplitude modulation

A modulation technique that combines phase and amplitude modulation to increase the number of bits per baud.

RA, access rate

The data rate, in bps of the frame relay link. The rates available are in increments of 64 and 56 Kbps segments (64, 128, 192, etc. or 56, 112, 168, etc.).

RAM, random access memory

A storage device into which data can be entered (written) and read; usually (but not always) a volatile semiconductor memory.

RBOC, Regional Bell Operating Companies

The seven Regional Bell Operating Companies that are committed to developing and offering a standardized nationwide frame relay service to prevent the formation of public *frame relay islands*. Although this effort is not completed, it is well on its way to being realized by the standardization of the Network to Network Interface (NNI).

RD, receive data

An RS-232 data signal received by the data terminal equipment (DTE) from a data communications equipment (DCE).

remote analog loopback

An analog loopback that forms the loop at the line (analog output) side of the remote modem.

remote channel loopback

A channel loopback that forms the loop at the input (channel side) of the remote unit.

remote composite loopback

A link loopback that forms the loop at the output (composite side) of the remote unit.

remote digital loopback

A digital loopback that forms the loop at the input side of the remote modem.

remote terminal server (RTS)

An optional module for the Integration unit that provides remote access to an Ethernet local area network (LAN) over a wide area network (WAN), as well as from LAN to remote devices over the LAN.

request to send (RTS)

An RS-232 interface signal, sent from a data terminal equipment (DTE) to the data communications equipment (DCE), that indicates the DTE has data to transmit.

RI, ring indicator

An RS-232 interface signal, sent from the modem to the data terminal equipment (DTE), that indicates that an incoming call is present.

ring topology

A form of mesh topology where three or more nodes are connected to one another in the form of a ring (similar to a daisy chain with the loop closed). In the event of link failure, there is an alternate path between nodes. *See also* mesh topology.

RJ-type connector

A modular connector that complies with certain telco standards.

ROM, read-only memory

A nonvolatile semiconductor storage device manufactured with predefined contents.

router

A device that looks at a local area network (LAN) packet's destination address to determine which LAN network is its destination. The router will then find the best path to use to send the packet across the network(s).

RS-232

An Electronics Industry Association recommended standard that is the most common for connecting serial data processing devices. RS-232 specifies the electrical characteristics of the signals in cables that connect a data terminal equipment (DTE) to a data communications equipment (DCE). An RS-232 standard is functionally identical to ITT-TSU V.24/V.28.

RS-422

An Electronics Industry Association recommended standard for cable lengths that extended the RS-232 50 foot limit. Although introduced as a companion standard with RS-449, RS-422 is most frequently implemented on unused pins of DB-25 (RS-232) connectors. Electrically compatible with ITT-TSU recommendation V.11.

RS-423

An Electronics Industry Association recommended standard for cable lengths that extended the RS-232 50-foot limit. Although introduced as a companion standard with RS-422, RS-423 is not widely used. Electrically compatible with ITT-TSU recommendation V.10.

RS-449

An Electronics Industry Association recommended standard for the mechanical characteristics of connectors; introduced as a companion standard to RS-422 and RS-423. This specifies two connectors (a 37-pin connector and a 9-pin connector); not widely used.

RS-530

An Electronics Industry Association recommended standard for the implementation of standard RS-422 or RS-423 Driver/Receivers on a 25-pin connector (DB-25). This is intended as a replacement for RS-449 for most data services using the same connector as RS-232.

Rx, receive

An abbreviation meaning receive or reception.

secondary interconnect link

Also known as a backup link, the link serves as a back up to an interconnect link in the event of primary interconnect link failure.

server

A local area network node that provides services to other nodes on the LAN. Servers provide printer access and spooling, file access, gateways, etc.

SF, single frequency

See tone signalling.

shroud

The part of an Integration unit's stacking connector that is mounted on the underside of a module.

signaling

A handshaking protocol used between telephone equipment. Includes supervising (on/off hook line status), alerting (ringing), and call addressing (dialing) for switched services.

sign-on character

The first character sent on an auto-baud-rate circuit. It is used to determine the data rate.

single dial tone plan

A Universal Voice Module feature that supports PBX-to-PBX dialing over the network. It allows dialing of network extension digits sequentially with PBX digits without waiting for a dial tone from the distant PBX.

SNAPS

MICOM's System Network Architecture Protocol Spoofer for connecting the Integration unit and AS/400 host and IBM 5250 and 3270 controllers.

SNMP, Simple Network Management Protocol

A standard protocol used to monitor, troubleshoot, and control other SNMP-compliant devices attached to the network. SNMP defines a set of variables that must be kept and it specifies that all operations are a side-effect of fetching or storing data variables. The public domain standard is based on the operational experience of TCP/IP internetworks within DARPA/NSFnet.

software reset

A reset performed by the software. This may be a warm or cold start.

SOH, start of header

A control character used to indicate the beginning of a message header.

space

Represents a binary 0 in data communications.

spacer

A piece of hardware that separates one module from another in the unit.

stacking connector

A coupling containing electrical pins or sockets that are located on the top and bottom of a module board to connect electrical wires from one module board to another. The connector on the underside is referred to as a shroud, and the connector on top is referred to as a block.

STADIA

A MICOM product family that offers multiple Integration nodes in a single chassis. The Integration Hub is a STADIA product.

standard interface module

An interface (E&M, FXO, FXS) module for MICOM's Universal Voice Module that is designed to meet U.S. regulatory agency requirements.

start bit

The first bit in asynchronous transmission, used to indicate the beginning of a character.

stop bit

The last bit in asynchronous transmission, used to indicate the end of a character.

strapping

A hard-wire method used to configure an Integration unit module.

STX, start of text

A control character used to indicate the beginning of a message.

sub T-1

A term used generically for any data or voice equipment operating at rates below 1.544 Mbps. Generally this covers equipment operating at 9.6 Kbps to 512 Kbps; i.e., voice grade lines, Dataphone Digital Services (DDS) lines and Fractional T1 lines.

switch group

A group of switches encased in a block mounted on a printed circuit board. It is also called dip switch or configuration switch group.

switched traffic

Data which passes through the node. The traffic is neither originated nor answered at the node. Contrast with terminated traffic.

switching

Selective interconnection of ports of a like kind on request on local and/or remote nodes. Async and voice/fax ports can be switched; sync ports cannot. Contrast with force connect(ed).

SYN, synchronous idle

In synchronous transmission, a control character used to maintain synchronization and as a time fill in the absence of data.

sync

Short for synchronous that describes the method of transmitting data. *See* synchronous transmission.

synchronous transmission

Transmission in which the data characters and bits are transmitted at a fixed rate with the transmitter and receiver synchronized. This eliminates the need for the start and stop bits that are used in asynchronous transmission.

tail circuit

A circuit to a network node, normally a leased line.

Tc, committed rate measurement interval

The interval during which the user can send only Bc data and Be data. In general, the duration of Tc is proportional to the *burstiness* of the traffic. Tc is computed as $Tc = Bc/CIR$. Tc is not a periodic interval; instead it is used only to measure incoming data. Incoming data triggers the Tc interval, which continues until it completes its computed duration. *See also* Bc and CIR.

TCP/IP, Transmission Control Protocol/Internet Protocol

A network protocol set. TCP/IP may be integral to an operating system, as in UNIX, or it can be a separate product.

IP is the low level protocol for the TCP/IP protocol set. Ip provides packet delivery services between nodes; on the same level as IP are ARP and RARP.

TCP is a reliable stream-delivery, virtual circuit connection-oriented protocol that runs on top of IP. TELNET, FTP, and rlogin use TCP connections.

TD, transmit data

A control signal where data is sent from the data terminal equipment (DTE) to data communications equipment (DCE).

TDM, time-division multiplexer

A multiplexer which apportions the time available on its composite link between its channels, usually interleaving bits or bytes of data from successive channels.

telco

An abbreviation for any telephone company.

terminal

Any device capable of sending or receiving data over a data communications channel.

terminated traffic

Data which is either originated or answered on the local node. Devices are attached directly to the node. Contrast with switched traffic.

tie line

A line leased from the telephone company for the purpose of connecting two PBX units. This allows private communication between two sites.

timeout

The expiration of a predefined interval which then triggers some action.

T, measurement interval

The time interval over which rates and burst sizes are measured. In general, the duration of T is proportional to the burstiness of the traffic. This measurement is provisioned in multiples of 100 ms.

tone signaling

A configurable option in E&M-strapped voice/fax channels.

traffic

Generic term for communications activity over a link.

Tx, transmit

An abbreviation for transmit, transmitter, transmission or transmitting.

Types I to V

Strapping options on the voice/fax module used to match the E&M-strapped channel with one of five PBX trunk types.

Universal Voice Module

MICOM's voice/fax module with plug-in modules for the required interface (E&M, FXO, and FXS).

VF, voice frequency

Any frequency within that part of the audio-frequency range essential for speech transmission of commercial quality (300-3000 Hz). This is the frequency range used over telephone lines.

virtual circuit

A logical path between two subscribers on a network that is established only for the duration of the call.

WAN, wide area network

A network that connects one or more remote locations via common-carrier provided lines. Contrast with LAN.

warm start

A system reset that maintains the current configuration. In the Integration unit a warm start may be performed in the Command Facility or at front of the unit.

XON, XOFF

Control characters used for flow control.

X.21 bis link

Commonly used in European countries, this is a *pay as you go* link. When a signal is raised, the modem automatically establishes a link to the remote side. This link is utilized for Integration units-to-MICOM mux connections.

Zero CIR

A service offered on some public frame relay networks providing no committed information rate (CIR); you only pay for the bandwidth when used. Since there is no commitment from the carrier provider, the risk is that you may not be able to communicate at any time.

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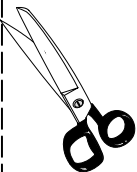
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